

# NOAA PROFILER NETWORK



**TECHNICAL REVIEW**

**FEBRUARY 25, 2003**

# NOAA PROFILER NETWORK

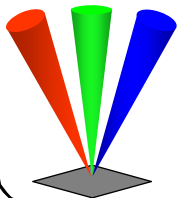
## TECHNICAL REVIEW

### Introduction and Highlights

Presented by  
**Margot H. Ackley**

SUPPORT STAFF

Robert L. Cinea



February 25, 2003



# NOAA PROFILER NETWORK TECHNICAL REVIEW

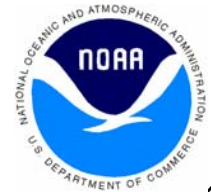
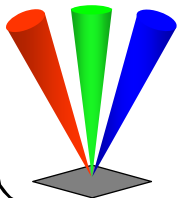
February 25, 2003

## AGENDA

- **Introduction and Highlights** **M. Ackley**
- **NPN/CAP Operations, Capability & Results** **D. van de Kamp**
- **Software Development and Web Services** **A. Pihlak & P. Miller**

## BREAK

- **Facilities and Systems Administration** **B. Kelley**
- **Engineering and Field Support** **M. Shanahan & R. Strauch**
- **Future Focus and Summary** **M. Ackley**



# FORECAST SYSTEMS LABORATORY

Demonstration Division

NOAA Profiler Network

&

GPS-MET Demonstration Network



**Margot Ackley, Chief**  
Robert Cinea, Office Asst.

**Software  
Development &  
Web Services**

**Alan Pihlak  
Chief**

Leon Benjamin

Mike Foy

Rob Prentice

Scott Stierle

**Facilities  
Management &  
Systems Adm.**

**Bobby Kelley  
Chief**

Jim Bussard

Mike Pando

**Network  
Operations**

**Doug  
van de Kamp  
Chief**

Norm Abshire

Mike Bowden

Jim Budler

Daphne Grant

**Engineering &  
Field Support**

**Mike Shanahan  
Chief**

Norm Abshire

Mac Carrithers

Dave Glaze

Brian Koonsvitsky

Brian Phillips

Richard Strauch

David Wheeler

**GPS-MET  
Observing  
Systems**

**Seth Gutman  
Chief**

Kirk Holub

Susan Sahm

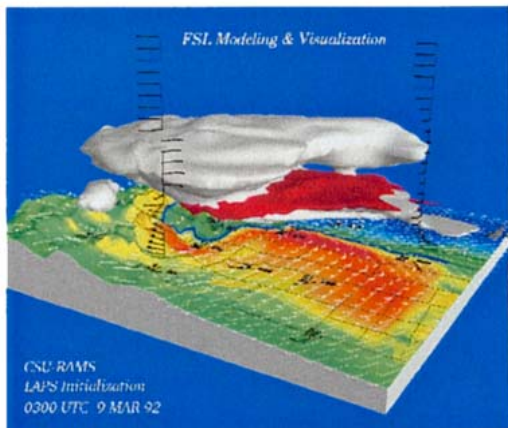
Jebb Stewart

# Forecast Systems Laboratory NOAA's Technology Transfer Lab



Information  
Systems

Observing  
Systems



Atmospheric  
Assimilation and  
Modeling

Advanced  
Computing



Mission: Weather observations, analysis, and forecasting

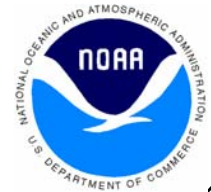
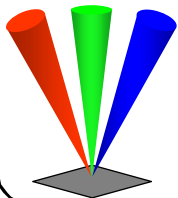
Resources: Over 200 people  
Over \$20 million



# NOAA PROFILER NETWORK (NPN)

## OVERVIEW

- **The NPN began in 1986 with a Congressional Initiative for \$6 million/year.**
- **Achieved full operational capability on May 18, 1992 with acceptance of the final system at Blue River, Wisconsin.**

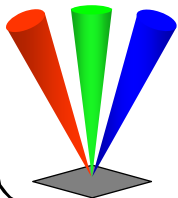


## NOAA PROFILER NETWORK (NPN)

### MISSION STATEMENT

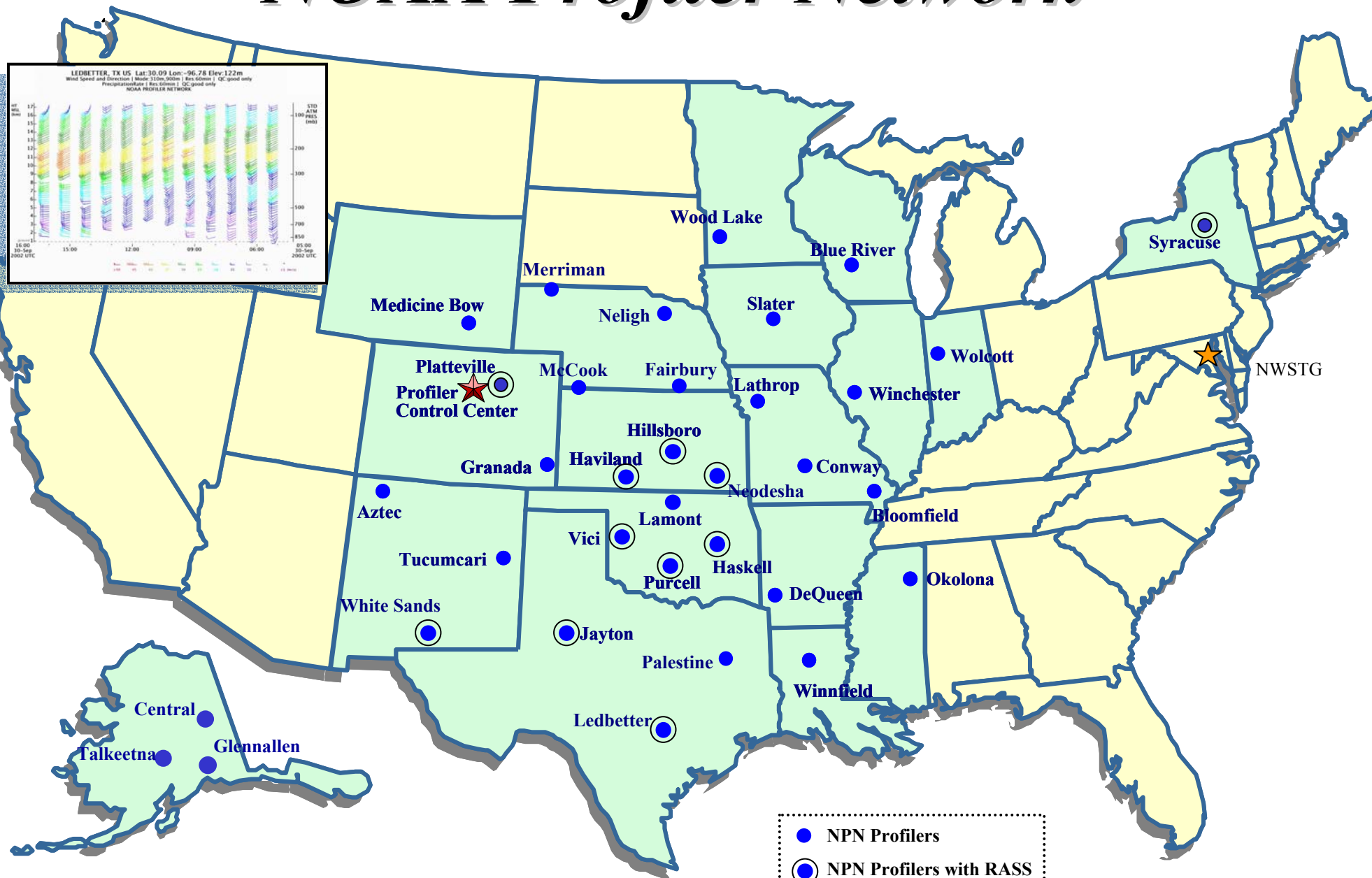
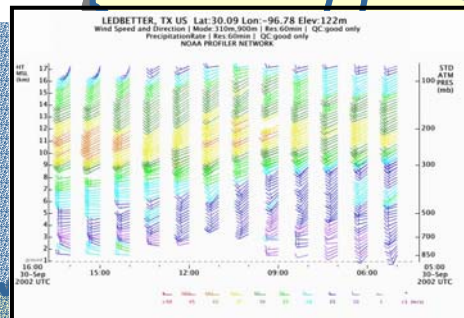
**To Develop, Deploy and Operate a Network of  
30 Wind Profilers in the Central United States.**

**In Cooperation with NWS and Other Agencies,  
Conduct an Assessment of that Network.**





# NOAA Profiler Network

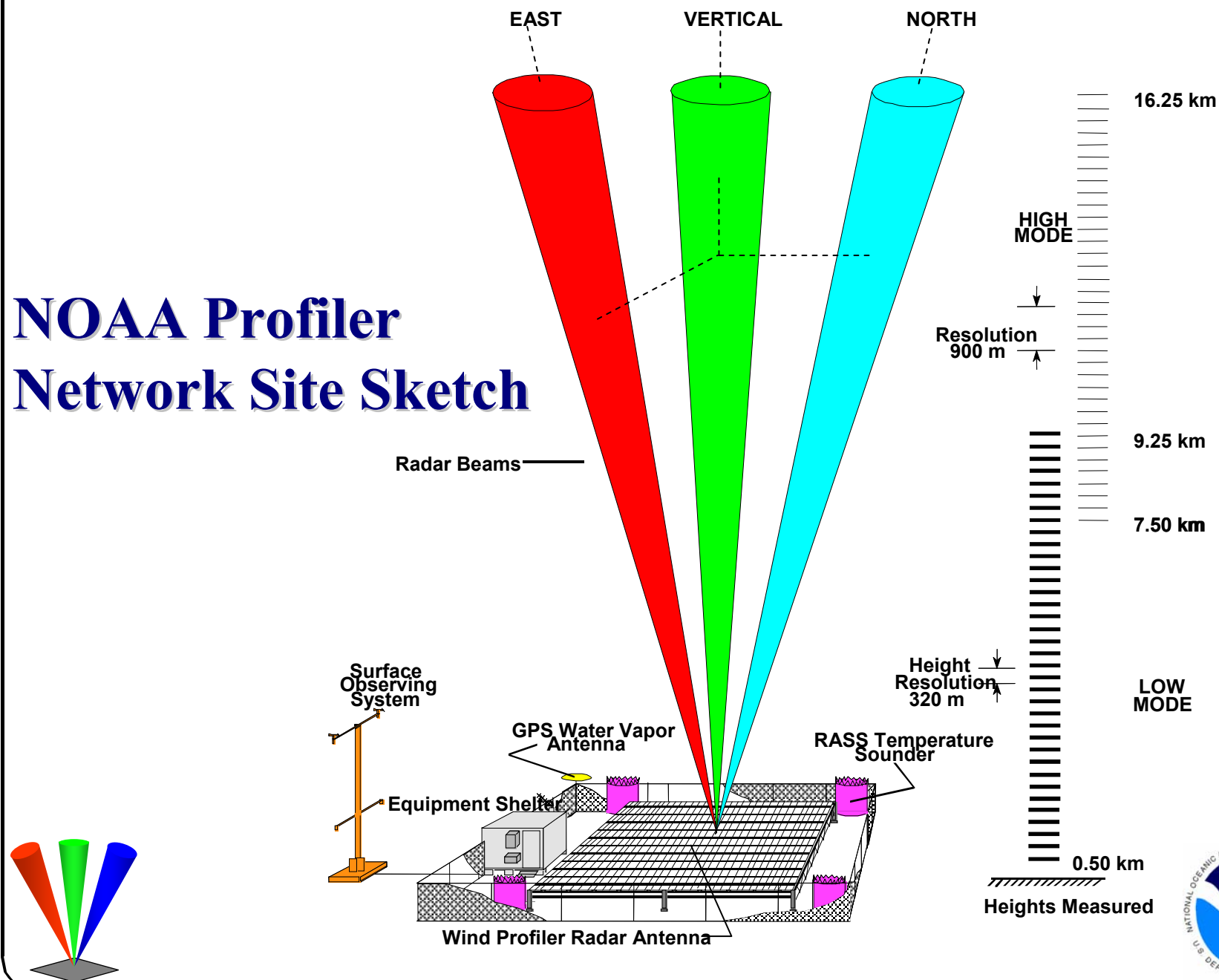


- NPN Profilers
- NPN Profilers with RASS

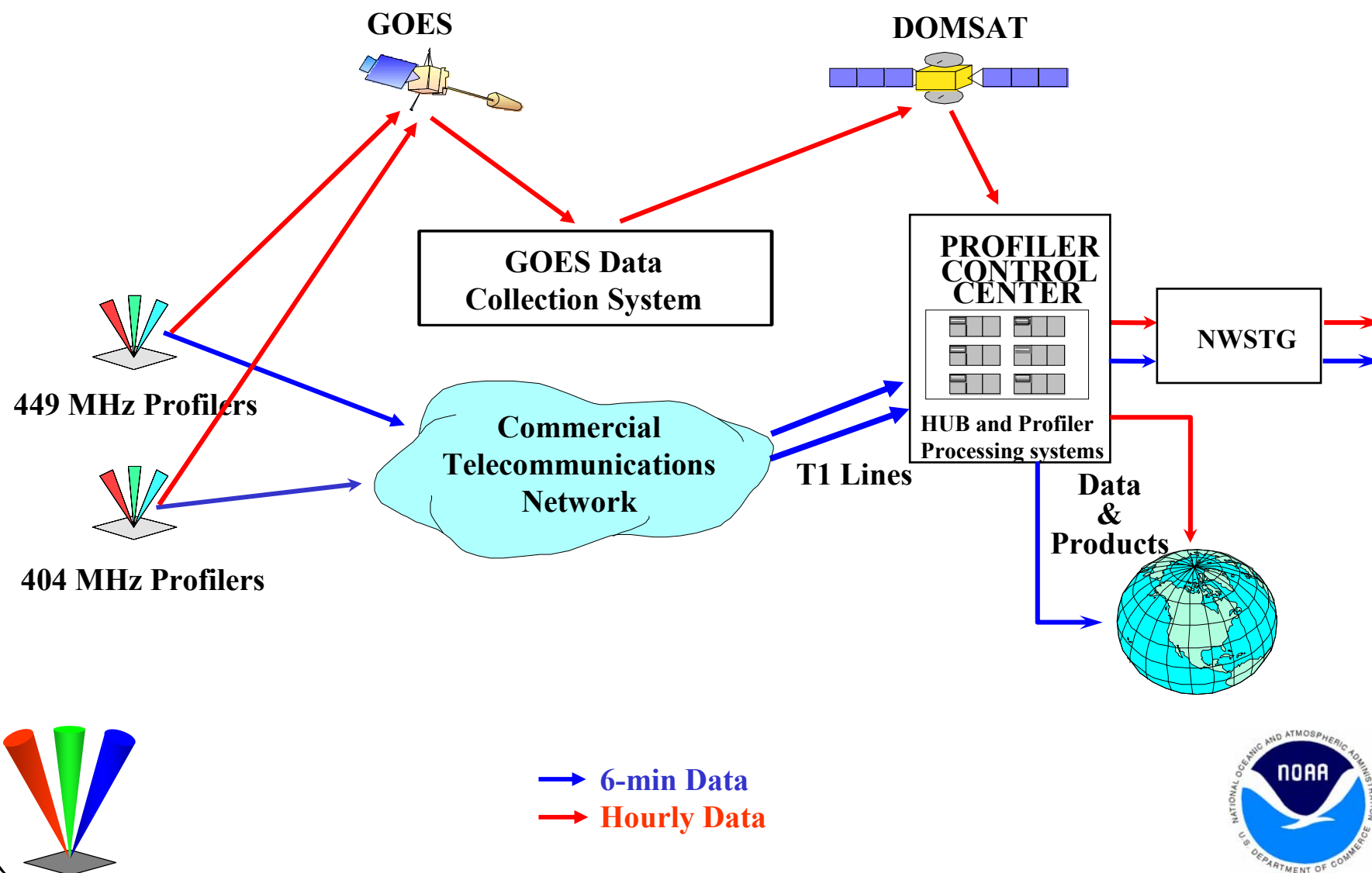
**Profiler Program Office**  
325 Broadway, Boulder, Colorado 80305-3328  
(303) 497-6200



# NOAA Profiler Network Site Sketch



# NOAA Profiler Network Data Flow



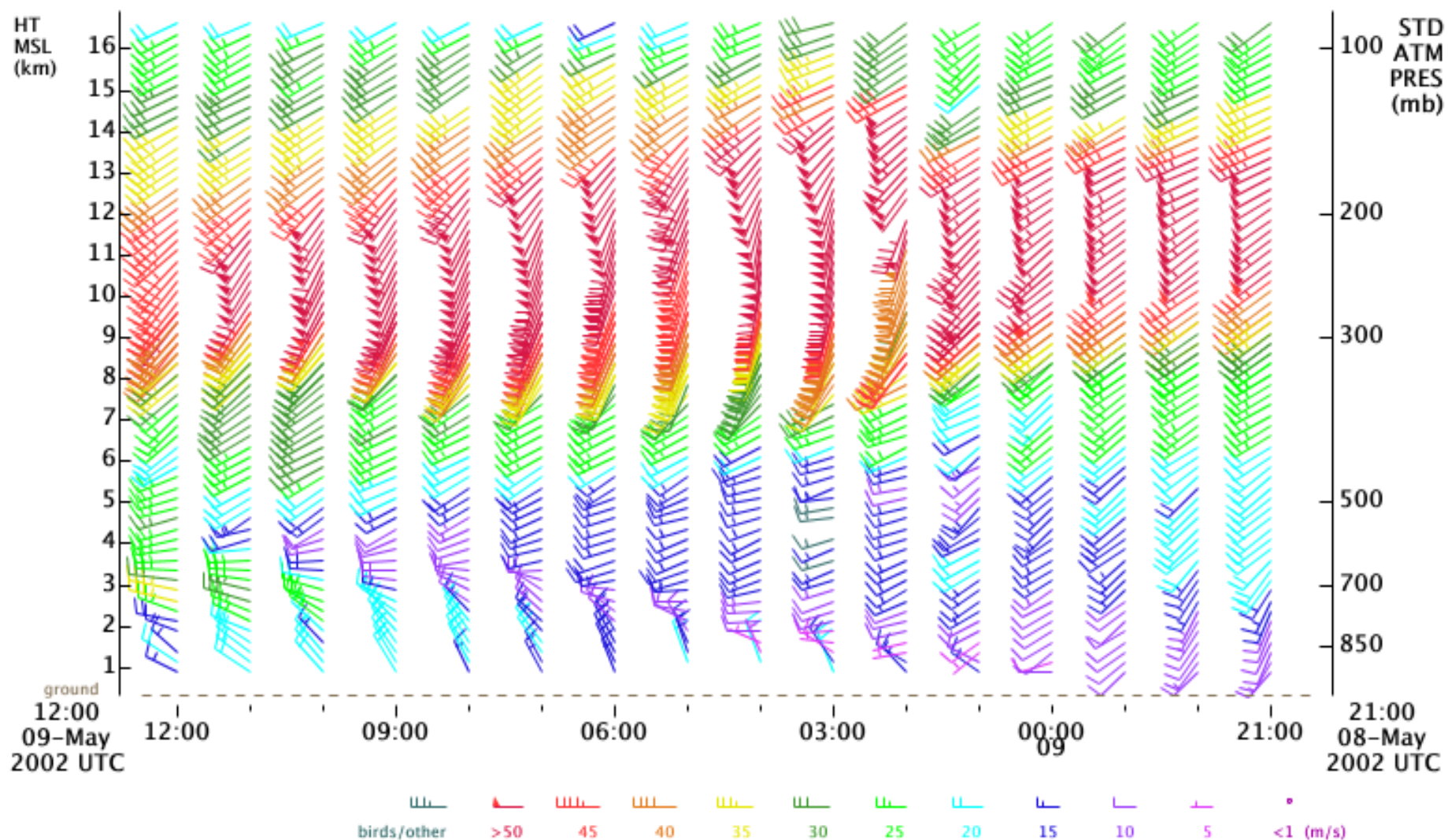








SLATER, IA US Lat:41.9 Lon:-93.7 Elev:315m  
Wind Speed and Direction | Mode:310m,900m | Res:60min | QC:good+BIRD  
PrecipitationRate | Res:60min | QC:good+BIRD  
NOAA PROFILER NETWORK



## WEEKLY PROFILER NETWORK REVIEW

Time Period: Week of 7-FEB-2003 to 13-FEB-2003 (Fri. - Thurs.)

Network Report	Maximum 6-Minute Comms Availability	Hub Availability	Consensus Failure Rate	Hourly Output Sent (avg.)	AWIPS Product Availability
----------------	--	---------------------	------------------------------	---------------------------------	----------------------------------

Network	96.5%	100.0%	13.3%	97.1%	96.2%
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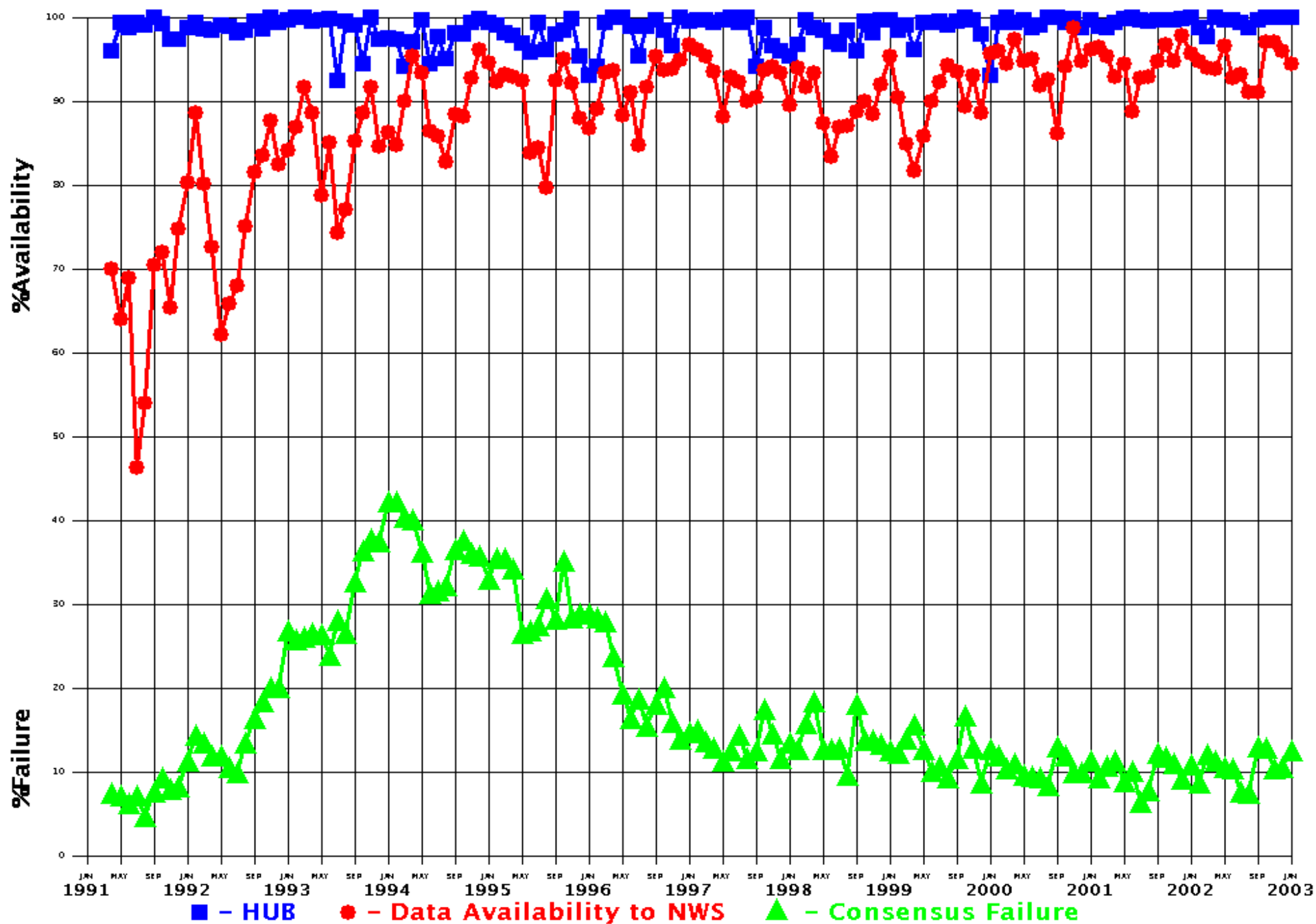
Profiler Report	Hourly Data Available on Hub (%)	Loss of Hourly Data (fault/test) (%)	Loss of Hourly Data (comms.) (%)	Hourly Output Sent (%)	Consensus Failure Rate (%)
--------------------	--	--	--	---------------------------------	-------------------------------------

Aztec, NM	100.0%	0.0%	0.0%	100.0%	9.4%
Bloomfield, MO	100.0%	0.0%	0.0%	100.0%	9.8%
Blue River, WI	100.0%	0.0%	0.0%	100.0%	8.2%
Central, AK	99.4%	0.0%	0.6%	99.4%	17.5%
Conway, MO	94.1%	3.6%	2.4%	94.0%	17.4%
Dequeen, AR	97.0%	3.0%	0.0%	97.0%	9.8%
Fairbury, NE	100.0%	0.0%	0.0%	100.0%	7.9%
Glennallen, AK	96.4%	0.0%	3.6%	96.4%	38.2%
Granada, CO	80.4%	17.9%	1.8%	80.4%	6.0%
Haskell, OK	96.4%	3.6%	0.0%	96.4%	10.8%
Haviland, KS	89.9%	10.1% +	0.0% +	89.9%	15.4%
Hillsboro, KS	100.0%	0.0%	0.0%	100.0%	2.9%
Jayton, TX	98.3%	0.6%	1.2%	98.2%	7.5%
Lamont, OK	83.4%	15.5%	1.2%	83.3%	14.2%
Lathrop, MO	100.0%	0.0%	0.0%	100.0%	16.4%
Ledbetter, TX	96.4%	3.6%	0.0%	96.4%	7.6%
Mccook, NE	88.1%	11.3%	0.6%	88.1%	5.7%
Medicine Bow, WY	100.0%	0.0%	0.0%	100.0%	6.6%
Merriman, NE	99.4%	0.6%	0.0%	99.4%	10.2%
Neligh, NE	100.0%	0.0%	0.0%	100.0%	8.1%
Neodesha, KS	99.4%	0.6%	0.0%	99.4%	17.6%
Okolona, MS	91.7%	6.5%	1.8%	91.7%	27.9%
Palestine, TX	100.0%	0.0%	0.0%	100.0%	6.5%
Platteville, CO	97.0%	0.0%	3.0%	97.0%	16.8%
Purcell, OK	100.0%	0.0%	0.0%	100.0%	16.3%
Slater, IA	100.0%	0.0%	0.0%	100.0%	8.6%
Syracuse, NY	0.0%	100.0% +	0.0% +		
Talkeetna, AK	97.6%	1.8%	0.6%	97.6%	19.4%
Tucumcari, NM	99.4%	0.0%	0.6%	99.4%	11.1%
Vici, OK	100.0%	0.0%	0.0%	100.0%	32.2%
White Sands, NM	100.0%	0.0%	0.0%	100.0%	5.4%
Winchester, IL	100.0%	0.0%	0.0%	100.0%	12.2%
Winnfield, LA	97.6%	2.4%	0.0%	97.6%	25.2%
Wolcott, IN	100.0%	0.0%	0.0%	100.0%	12.7%
Wood Lake, MN	100.0%	0.0%	0.0%	100.0%	11.8%

+ = Edited Number

# NOAA Profiler Network

## 404 Profiler Data Availability

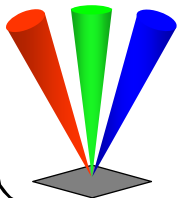


# MAJOR HIGHLIGHT OF LAST TWO YEARS COOPERATIVE AGENCY PROFILERS (CAP)

**Mission:** - To AGGRESSIVELY acquire profiler data from as many CAP systems as possible.

**Goal:** - To be the World's Center of Profiler Excellence  
and

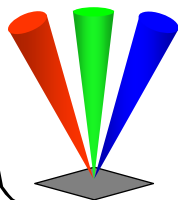
Have our program be the “One Stop” for all things  
“Profiler”.





## ACHIEVEMENTS

- Major increase in number of CAP systems
  - Profilers providing data as of January 22, 2003
    - ❖ NPN (35)
    - ❖ TARS (1); 9 yet to be deployed
    - ❖ JMA (25); 6 additional in 2003
    - ❖ Fixed Systems; North America (39)
    - ❖ Fixed Systems; Pacific/South America (3)
    - ❖ Mobile Systems; North America (15)
- Total Systems Operating: **118**
- Approximately 60% of non-JMA CAP have RASS
  - Additional data to NWS and other NPN customers increase value of program and NWS involvement.
  - Experience gained will be valuable for a national network





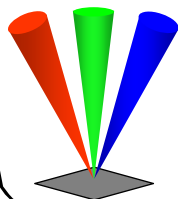
# Cooperative Agency Profilers

## Rutgers, NJ Profiler

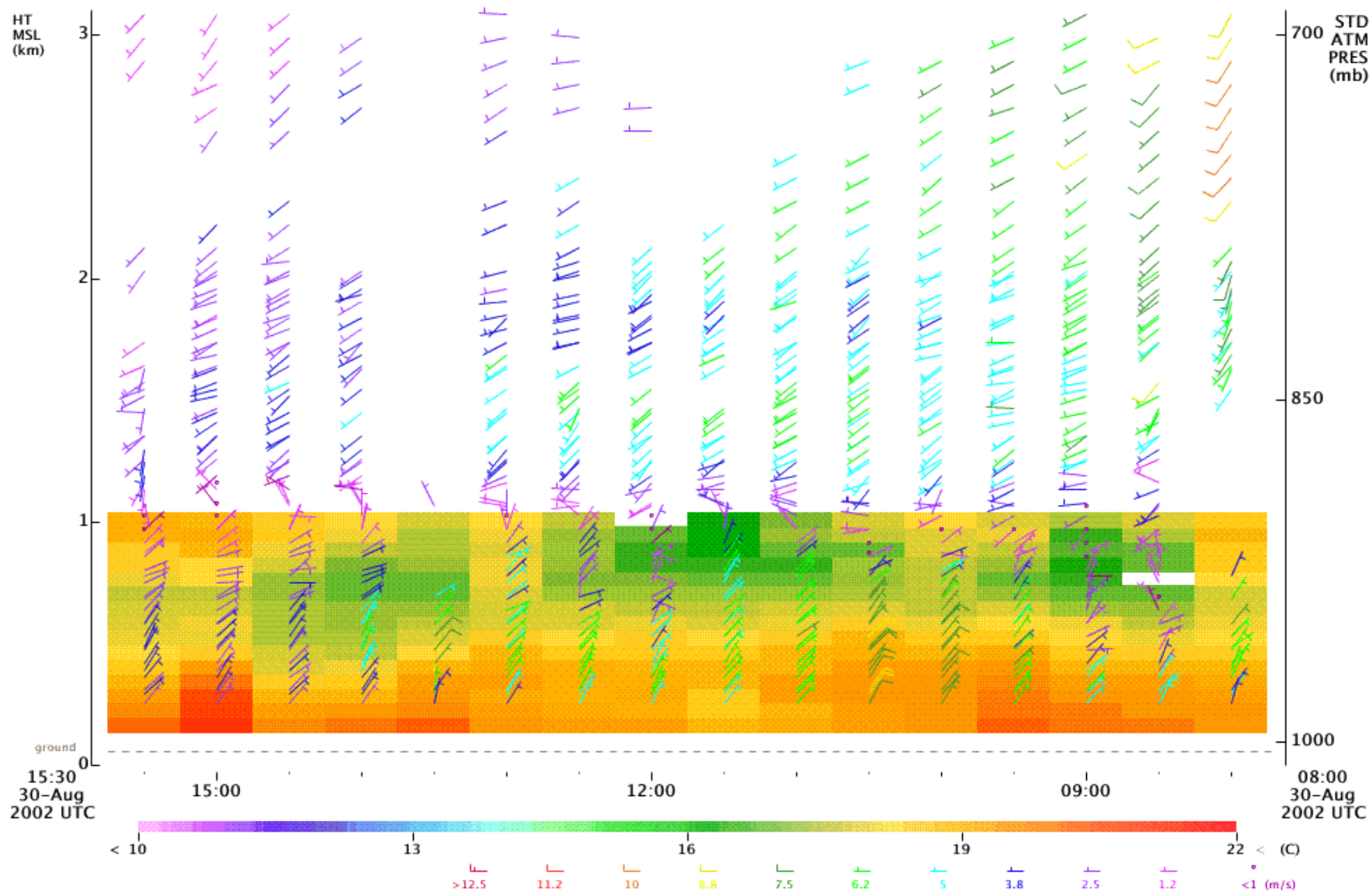


915 MHz profiler with RASS

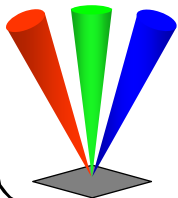
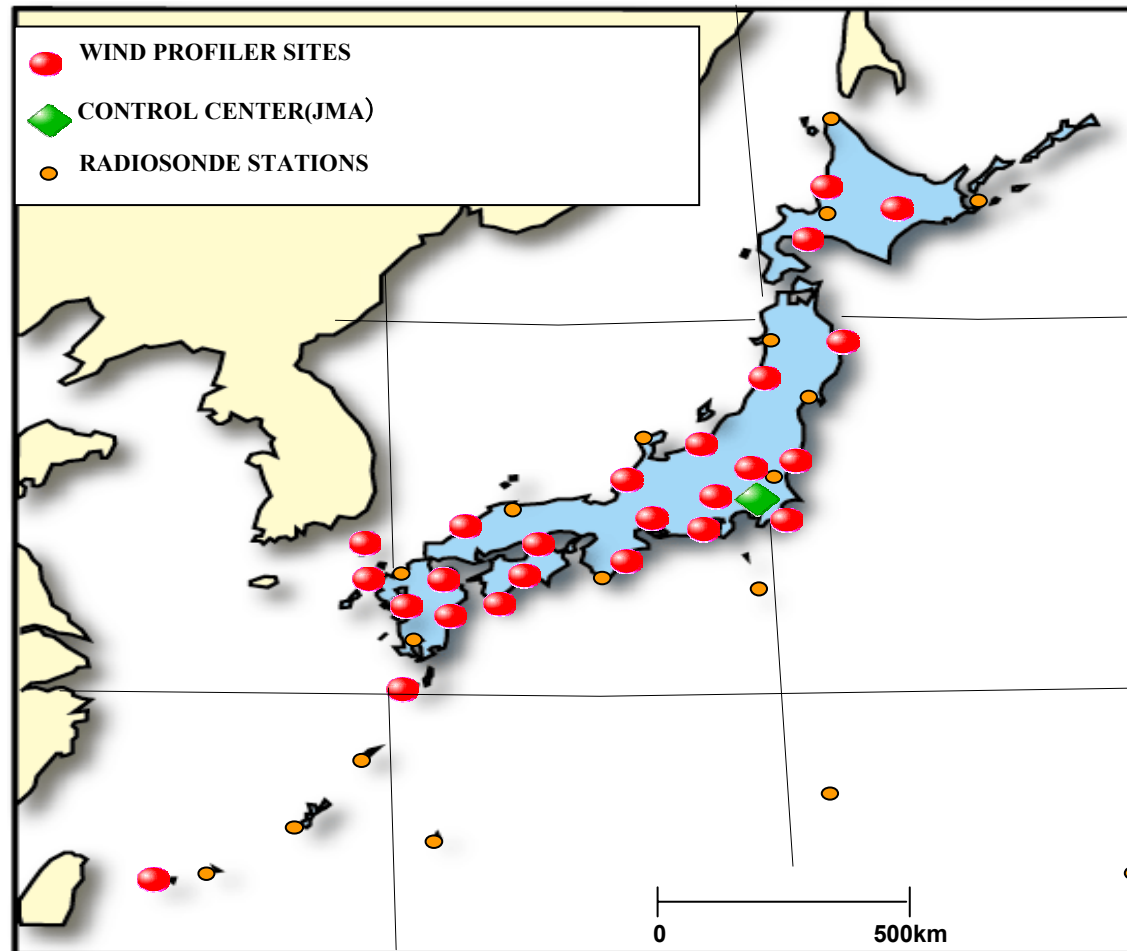
Courtesy of Rutgers University



**RICHMOND VA Lat:37.6 Lon:-77.5 Elev:61m**  
 Temperature | Mode:60m | Res:30min | QC:good only  
 Wind Speed and Direction | Mode:105m,60m | Res:30min | QC:good only  
 VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY



# Cooperative Agency Profilers



**WINDAS - Japanese Meteorological Agency Profiler Network**



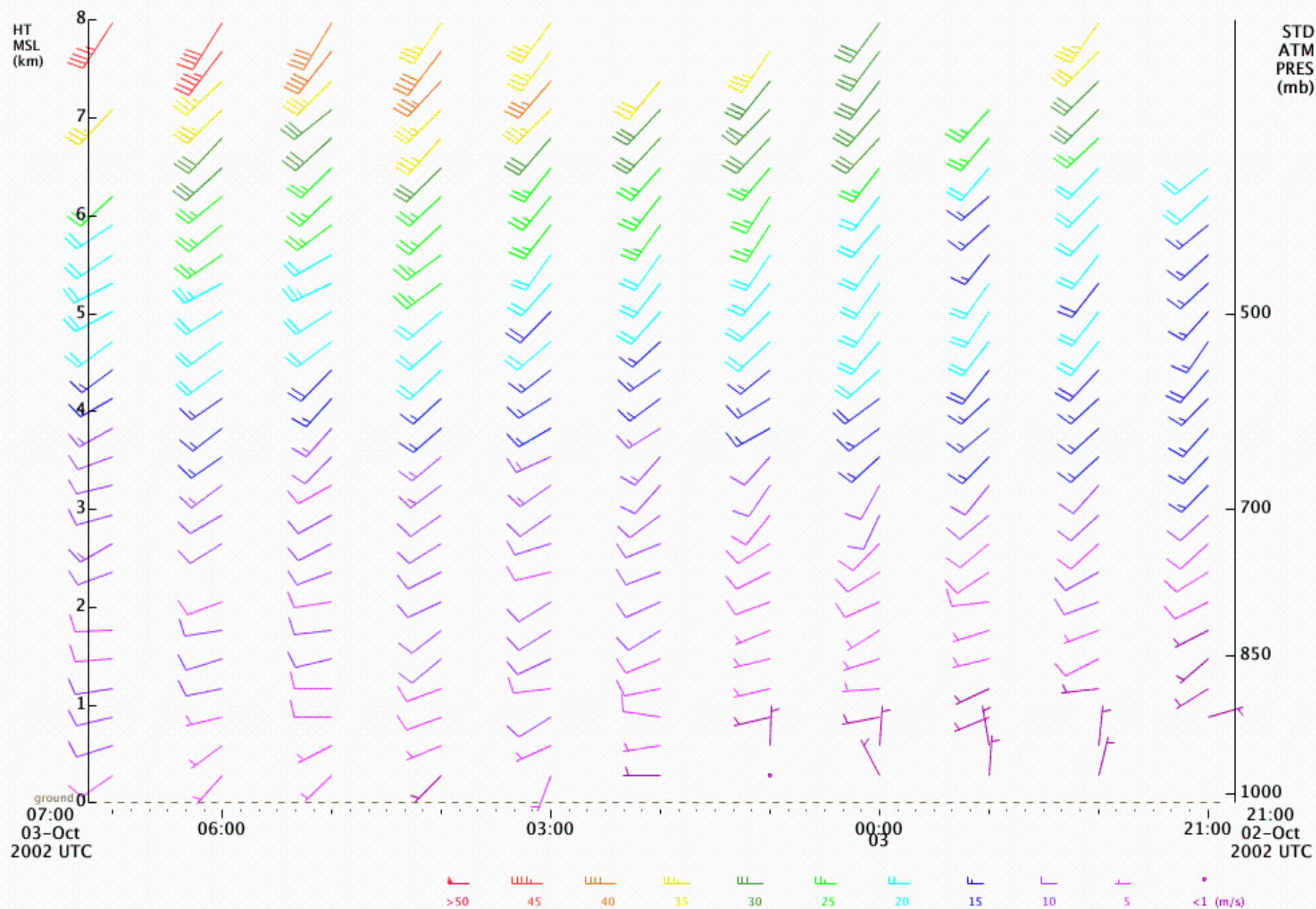




**JMA WINDAS 1.3 GHz Profiler**



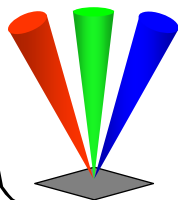
SHIZUOKA JP Lat:34.97 Lon:138.41 Elev:14m  
Wind Speed and Direction | Res:10min | QC:good only  
JAPAN METEOROLOGICAL AGENCY



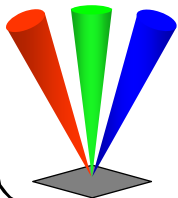


## **TARS NETWORK** **(Tethered Aerostat Radar System)**

- **Cooperative effort with: U.S. Air Force Combat Command (Funds)  
Environmental Technology Laboratory (ETL)  
National Weather Service – Southern Region**
- **Consists of 10 – 449 MHz Profilers supporting USAF Aerostats**
- **ETL prepares sites and installs profilers**
- **FSL operates, monitors and maintains profilers**
- **Profiler likely prototype for national network**



# Cooperative Agency Profilers

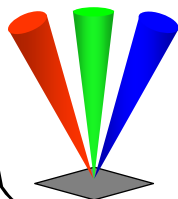


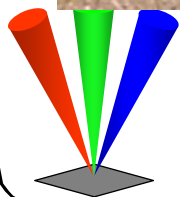
**TARS Aerostat – Wind profiler needed for operations**



# Cooperative Agency Profilers

## Location of TARS profilers





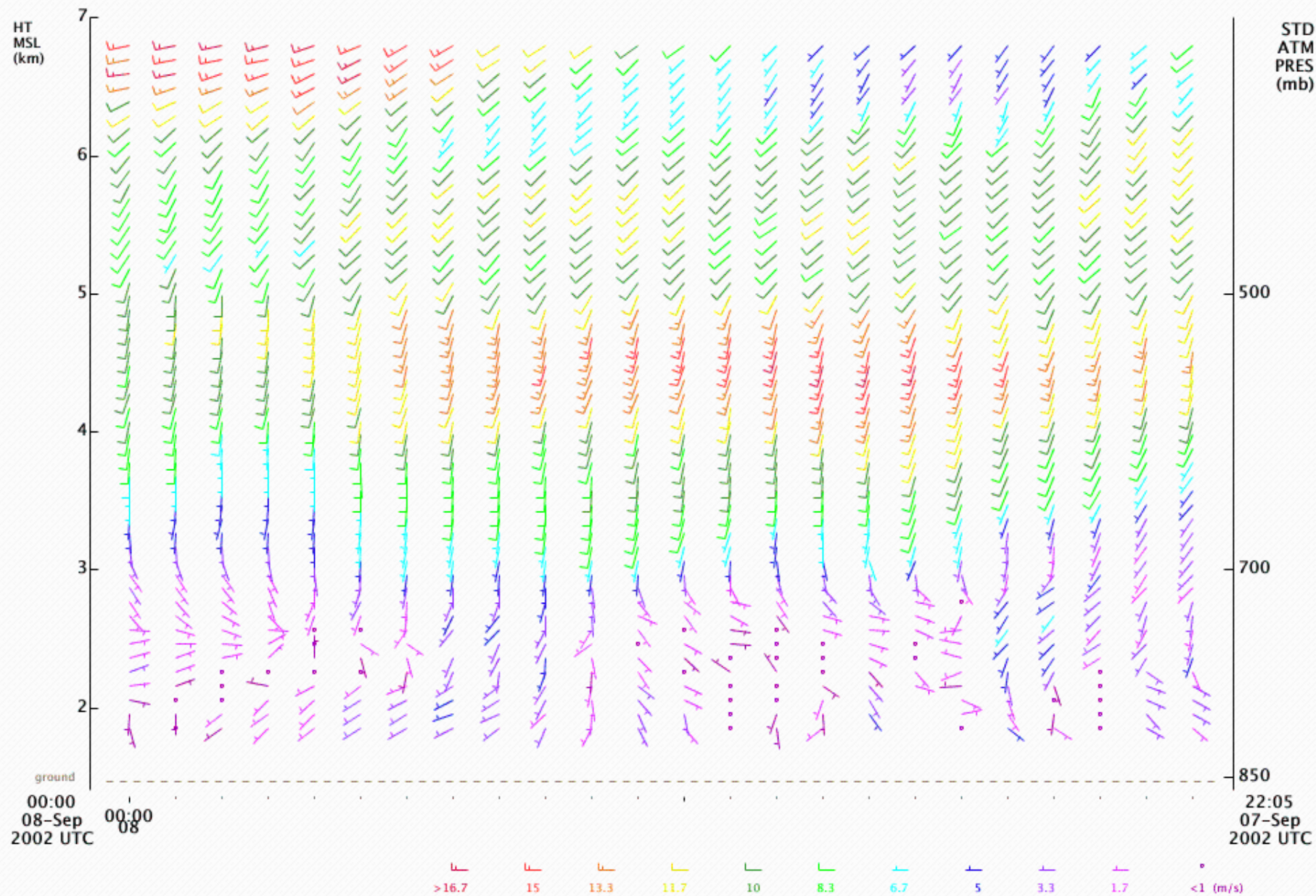
**TARS Ft. Huachuca, AZ. Quarter-scale 449 MHz Profiler**







FT HUACHUCA AZ Lat:31.51 Lon:-110.31 Elev:1,471m  
Wind Speed and Direction | Mode:105m | Res:5min | QC:good only  
NOAA ENVIRONMENTAL TECHNOLOGY LABORATORY  
Experimental Wind Data Only, Please Verify Before Using



# NOAA PROFILER NETWORK



**TECHNICAL REVIEW**

**FEBRUARY 25, 2003**

# **NOAA PROFILER NETWORK TECHNICAL REVIEW**

## **NPN and Cooperative Agency Profilers (CAP) Operations, Capability and Results**

**Presented by Douglas W. van de Kamp**

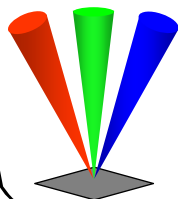
### **Network Operations Staff**

**Norman Abshire**

**Michael Bowden**

**Jim Budler**

**Daphne Grant**



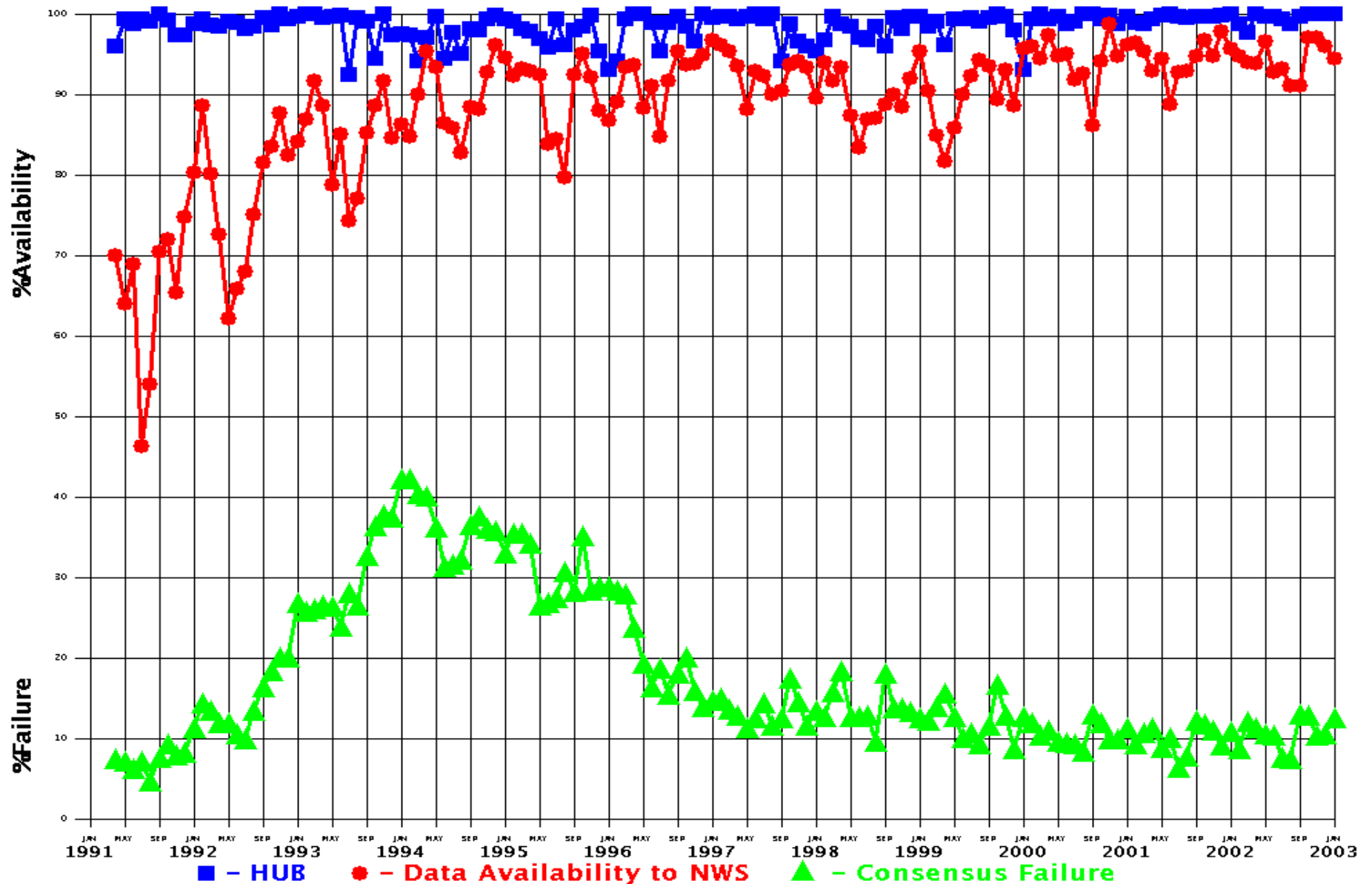
**February 25, 2003**



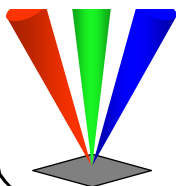
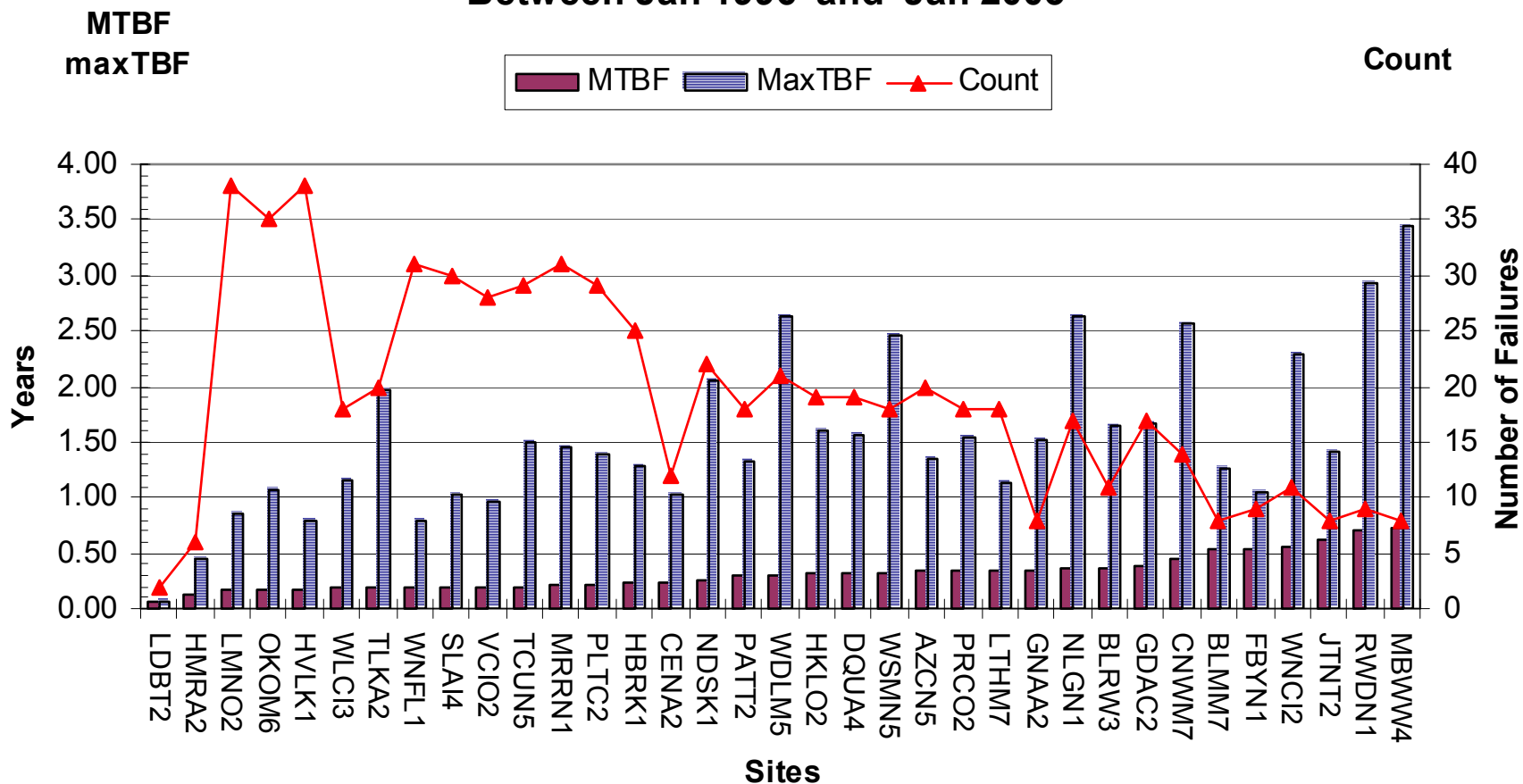


# NOAA Profiler Network

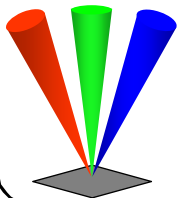
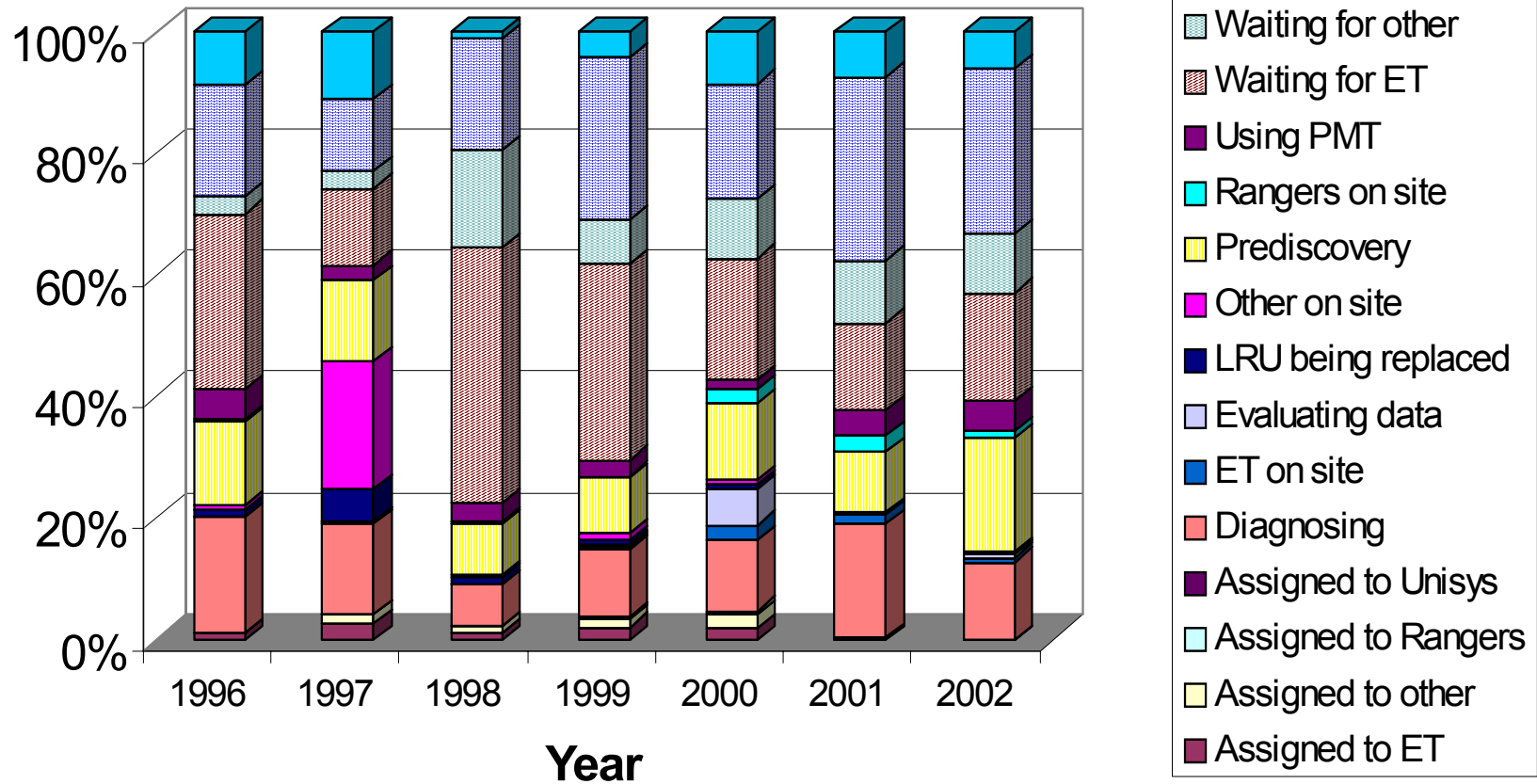
## 404 Profiler Data Availability



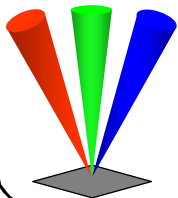
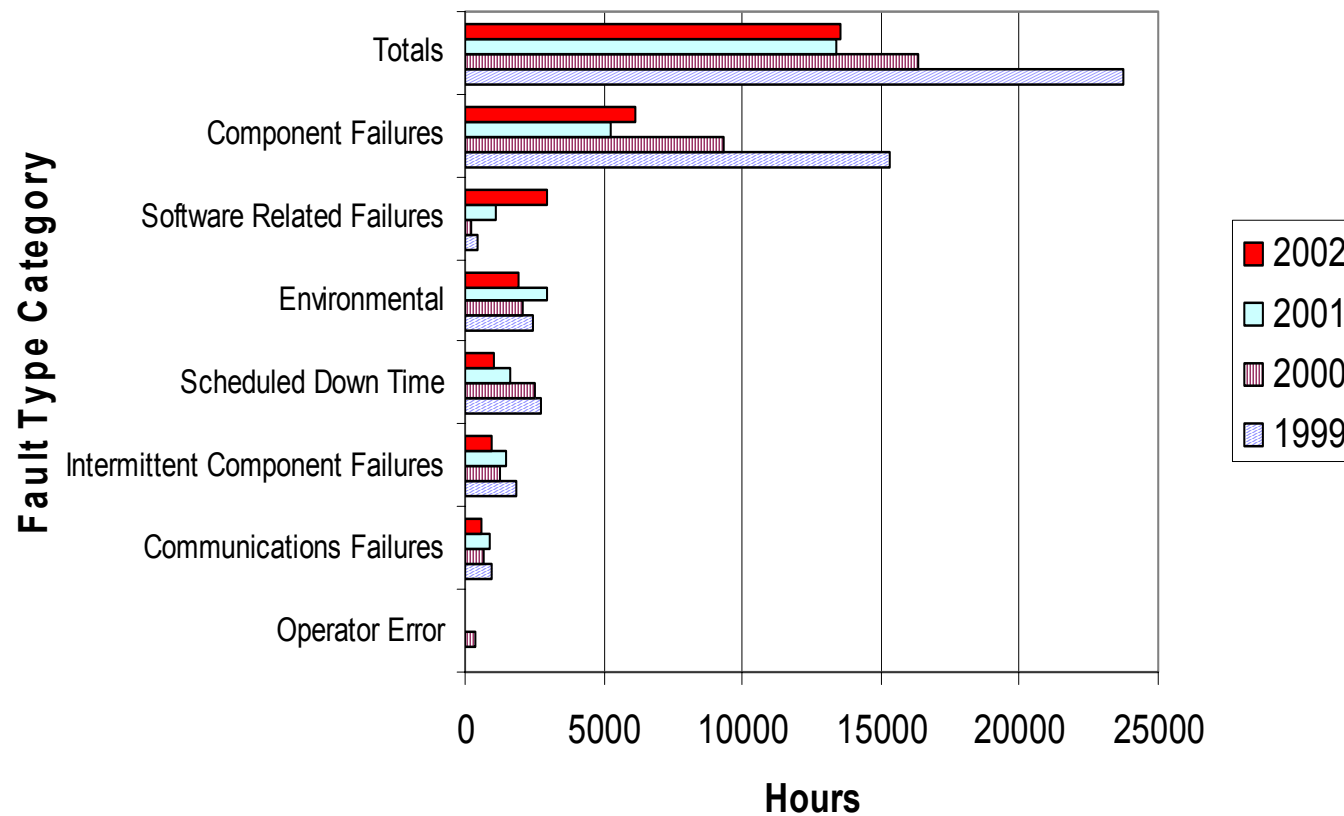
**NPN Site MTBF (Mean Time Between Failure)**  
**[Based on Data Outages > 24 Hours]**  
**Between Jan 1996 and Jan 2003**



## Distribution of Downtime

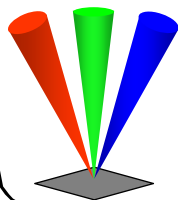


## Hours of Data Lost By Fault Type



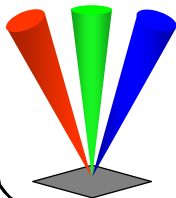
## **Recent Activity and Improvements**

- **Remote main power reset capability**
  - Attempted 226 times in FY02, successful 180 times (80%)
  - 4,700+ hours of additional profiler and GPS IPWV data
  - Increased NPN data availability by 1.5%
- **CAP data acquisition and monitoring**
- **Supported two site relocations and two new RASS installations**
- **DEC alpha checkout**
- **Platteville 449 MHz (2 processing methods)**
- **Ground clutter mitigation**
- **Reassigned GOES minutes**
- **Monitoring NWS Area Forecast Discussions**



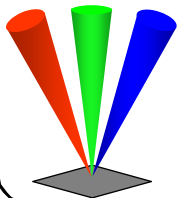
## **Ongoing Activities**

- **Operations and monitoring of 35 NPN sites**
  - **Coordination of Logistics**
  - **Fault tracking**
  - **Radio Acoustics Sounding Systems (RASS) at 11 NPN sites**
  - **GPS receiver and surface observations**
- **Monitoring of 200+ GPS systems**
- **Monitoring of ~ 90 CAP systems**
- **Search and Rescue Satellite-aided Tracking (SARSAT)**  
**inhibit schedule generation**



## **Ongoing Activities cont'd**

- **Training and Outreach activities**
- **Improved web displays**
- **Data quality issues**
  - **Ground clutter, internal interference, birds**
- **National Profiler Network planning**

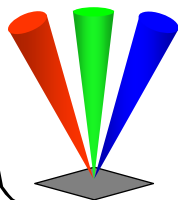




# Cooperative Agency Profilers

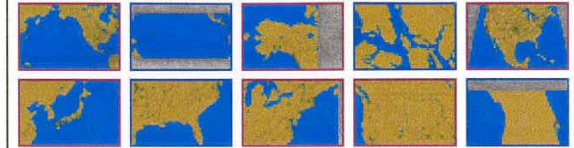
## Who Cooperates?

- Japan Meteorological Agency - 25
- NOAA Environmental Technology Laboratory - 13
- NOAA Aeronomy Laboratory - 4
- Kennedy Space Center And Cape Canaveral Air Force Station - 6
- Argonne National Laboratory ABLE/ARM Programs - 3
- NCAR Sponsored By The FAA - 3
- South Coast Air Quality Management District - 3
- White Sands Missile Range (Meteorology Branch) - 3
- Dugway Proving Ground (DPG) - 2
- Environment Canada - 2
- Department Of Interior Minerals Management Service - 2
- North Carolina Department Of Environment & Natural Resources (DENR) & Division Of Air Quality - 2
- San Diego Air Pollution Control District - 2
- San Joaquin Valley APCD - 2
- Texas Natural Resources Conservation Commission - 2
- Air Resources Laboratory, Special Operations and Research Division - 2
- Several others with one profiler





# NOAA Forecast Systems Laboratory Multi-Agency Profiler Graphical Data Displays Data provided by NOAA and other Agencies



[View Advanced \(Scaling and Historical Data\) Display Options](#)

## Basic Display Options [help](#)

Site Name:

LOS ANGELES, CA [LAXCA]

View:

Wind Profiles

Resolution:

60-minute

Beam:

Mode:

All

Preset:

Auto

Periods:

12

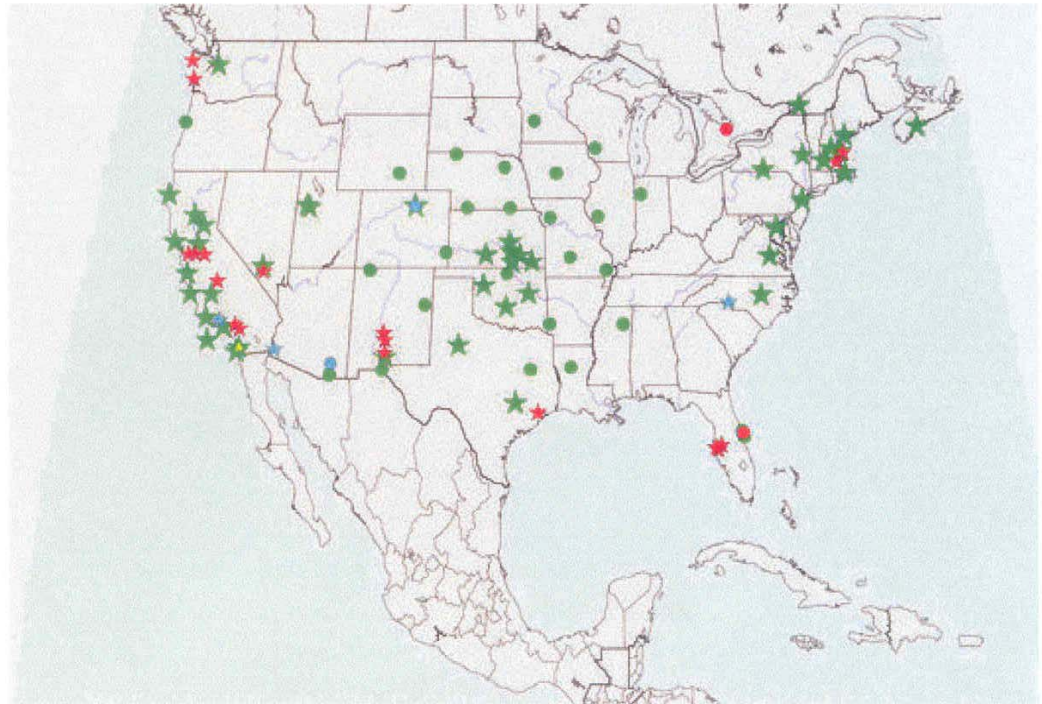
Plot Size:

M 800x550

Time Direction:

Right2Left

GET PLOT



Site: EL PASO TX [EPSTX]

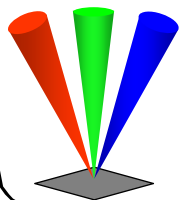
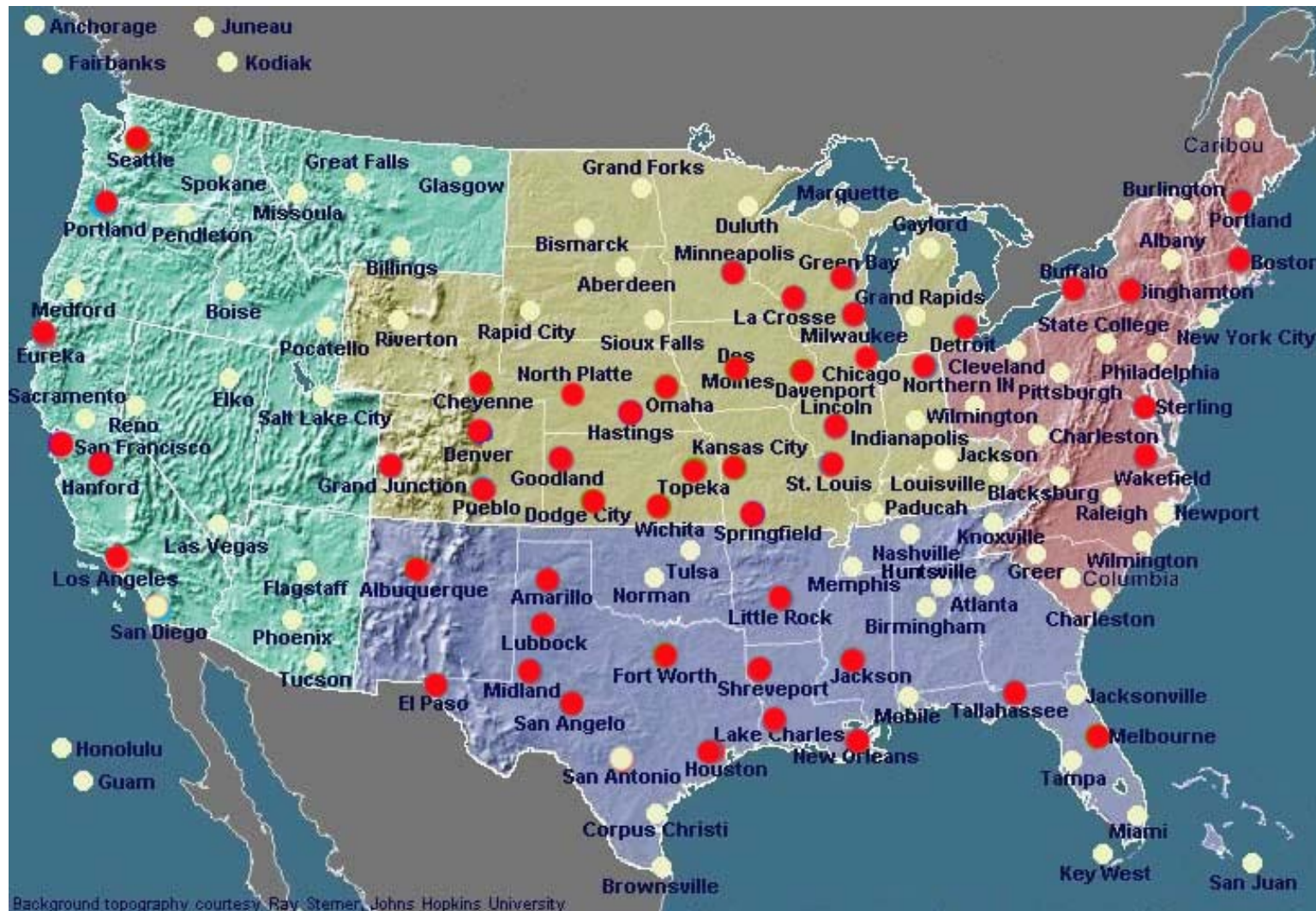
Source: TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Select a thumbnail image to change the view of large map.

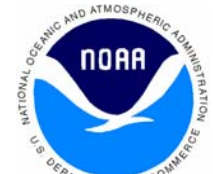
Click on site locations to load display options.

Click **Get Plot** to generate an image.



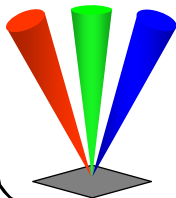


**NWS offices identifying use of Profiler data in their Area Forecast discussions (45 day period, December 1, 2002 to January 14, 2003)**



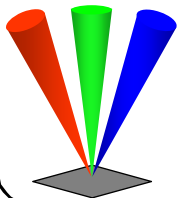
## Future Activity

- **Acquire raw spectra**
- **Improve data quality**
  - **Bird rejection**
  - **Ground clutter**
  - **Internal interference**
- **Acquire more CAP data**
- **Automated QA monitoring**
- **Improve RASS QA and display**
- **Automate remote main power resets**
- **Investigate additional profiler products**



## Future Activity cont'd

- **National Profiler Network planning**
  - **Platteville 449 MHz capabilities**
  - **Height coverage, gate spacing, resolution**
  - **Data quality/accuracy (3 beams vs. 5)**
  - **Data communications and monitoring**





# NOAA PROFILER NETWORK



**TECHNICAL REVIEW**

**FEBRUARY 25, 2003**

# **NOAA PROFILER NETWORK TECHNICAL REVIEW**

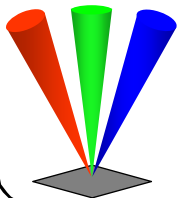
## **Software Development and Web Services**

**Presented by  
Alan E. Pihlak**

### **SOFTWARE DEVELOPMENT & WEB STAFF**

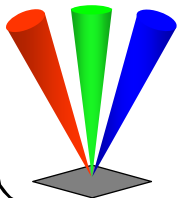
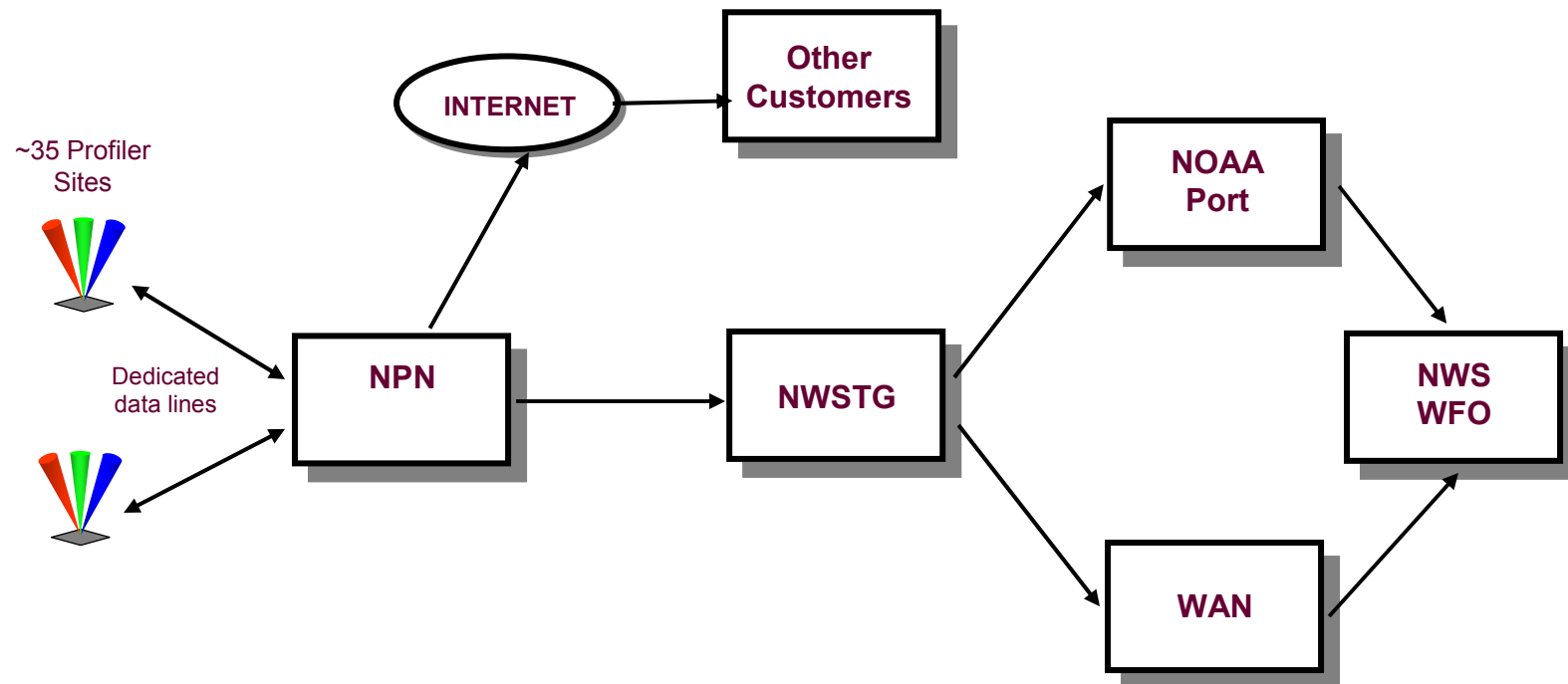
**Leon Benjamin  
Michael Foy  
Rob Prentice  
Scott Stierle**

**February 25, 2003**

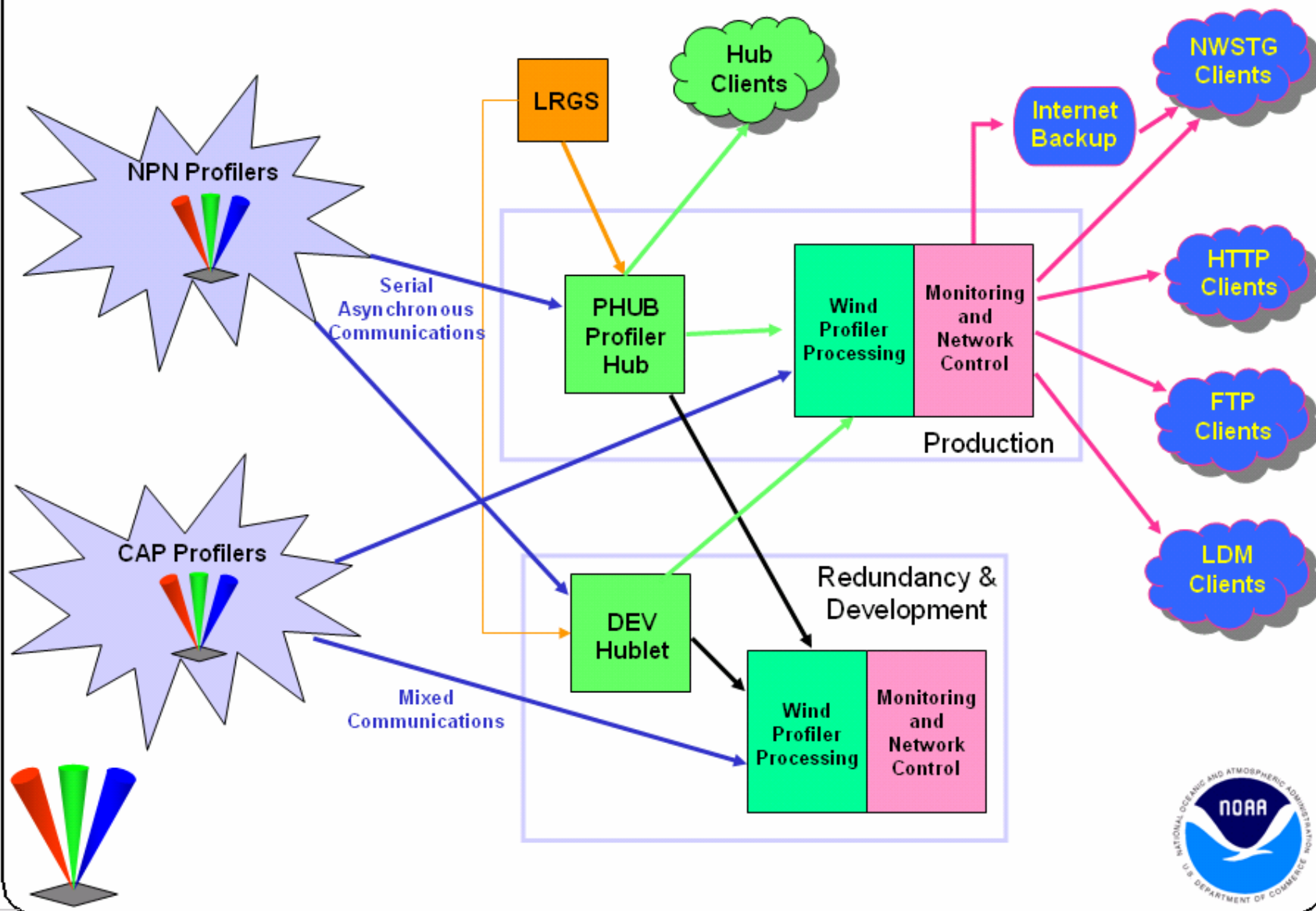


# Enable NWS Operations (from DD Tech Review 2001)

## Current data flow

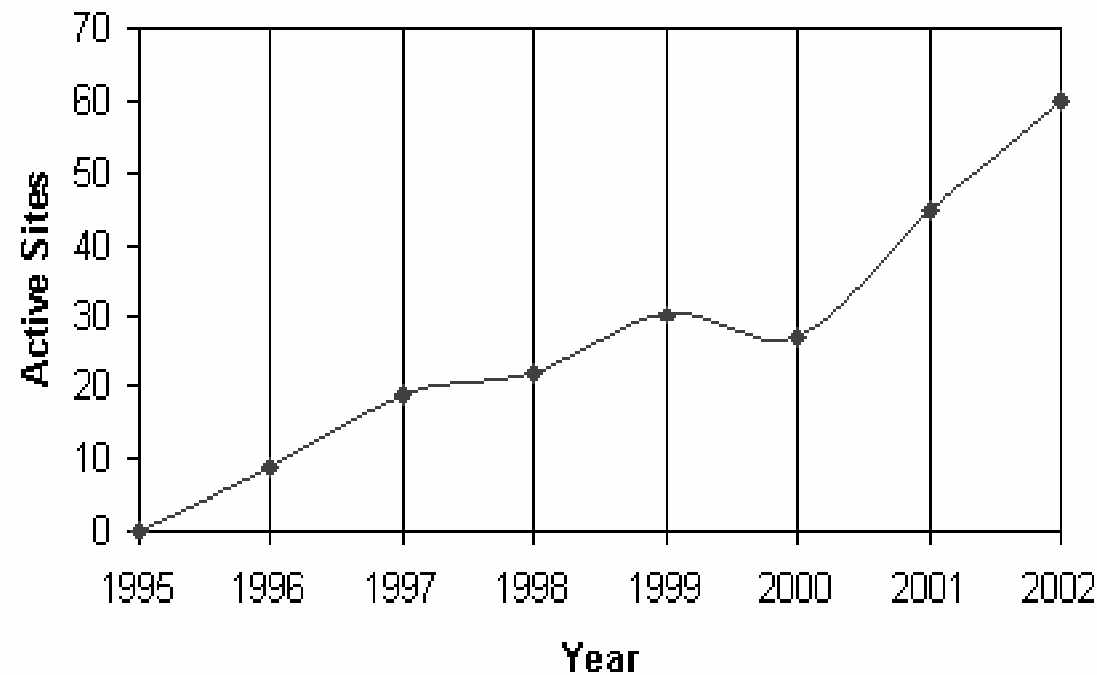


# NPN Current Processing

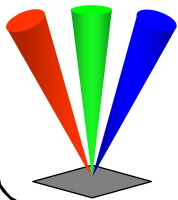


# Cooperative Agency Profilers

Number of CAP



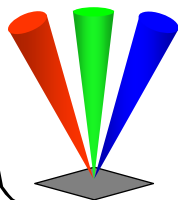
Increase in number of CAP from 1995 to 2002





# Cooperative Agency Profilers (CAP)

- **The good: ~60 profilers delivering data at an estimated cost of \$150 per month per profiler. NWS AFDs often mention CAPs in CA, WA, ME, FL, VA.**
- **The bad: approximately 30% of branch resources spent operating CAP network as the number of CAP profilers doubled from 2000 (30) to 2002 (60).**



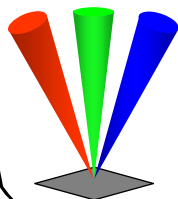
# Cooperative Agency Profilers (CAP)

- Leon Benjamin is recognized as the key person in the operation of the CAP acquisition network in maintaining and developing the CAP systems.
- Significant developments in viewing profiler data on AWIPS via LDAD ( upcoming).



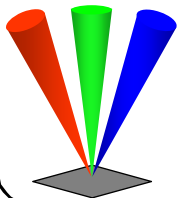
915 MHz profiler with RASS at Las Vegas

Courtesy of NOAA's Air Resources Laboratory



# Other CAP achievements

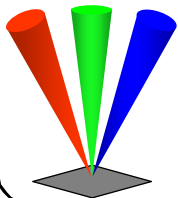
- **Currently acquiring JMA network profiler data.**
- **European profiler network data to be acquired soon.**
- **1 TARS site now included in CAP network, 9 more expected.**



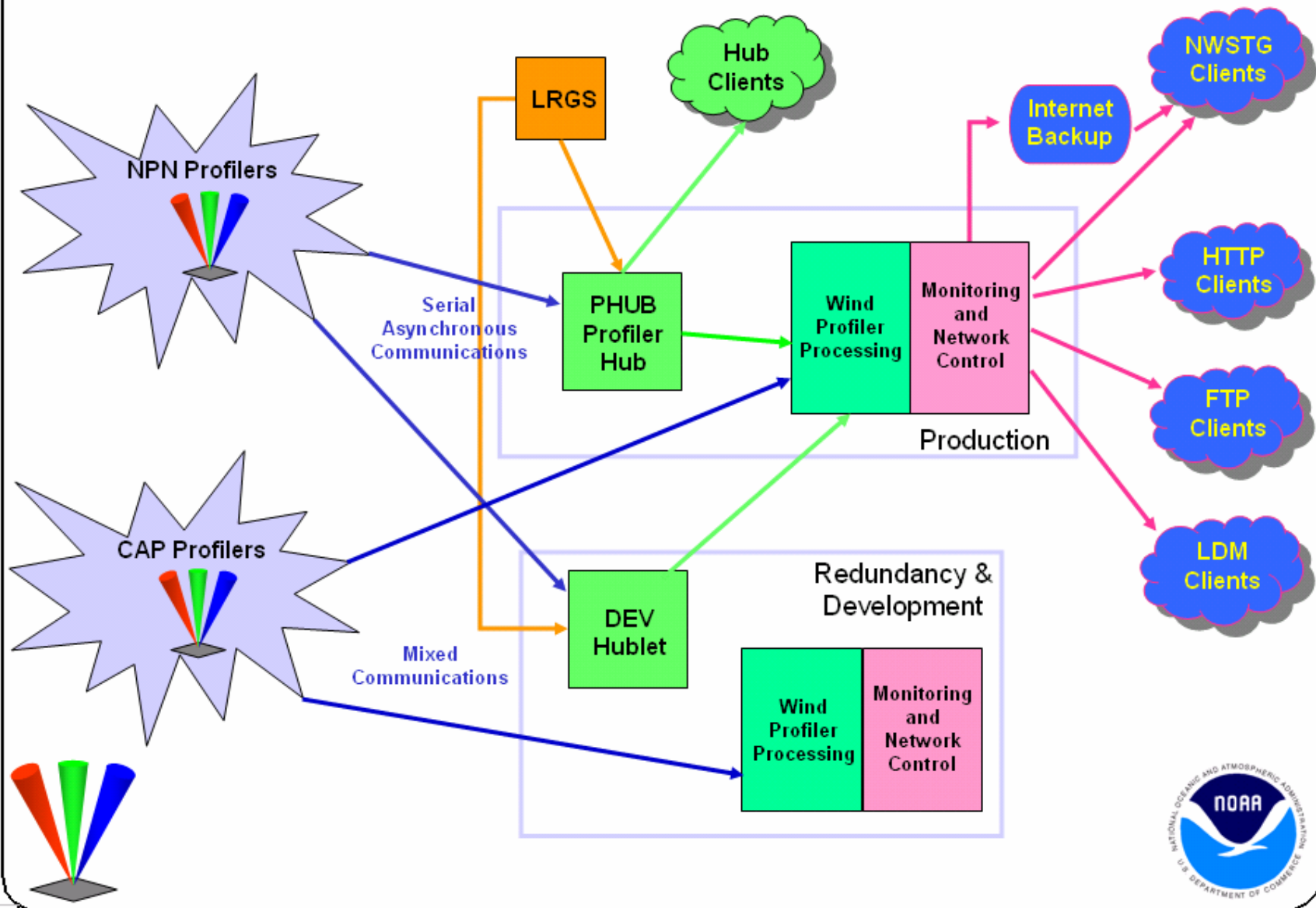
# NPN Transition



The NPN HUB system  
MicroVaxes  
Built in the 80's and early 90's  
98.8 % delivery record

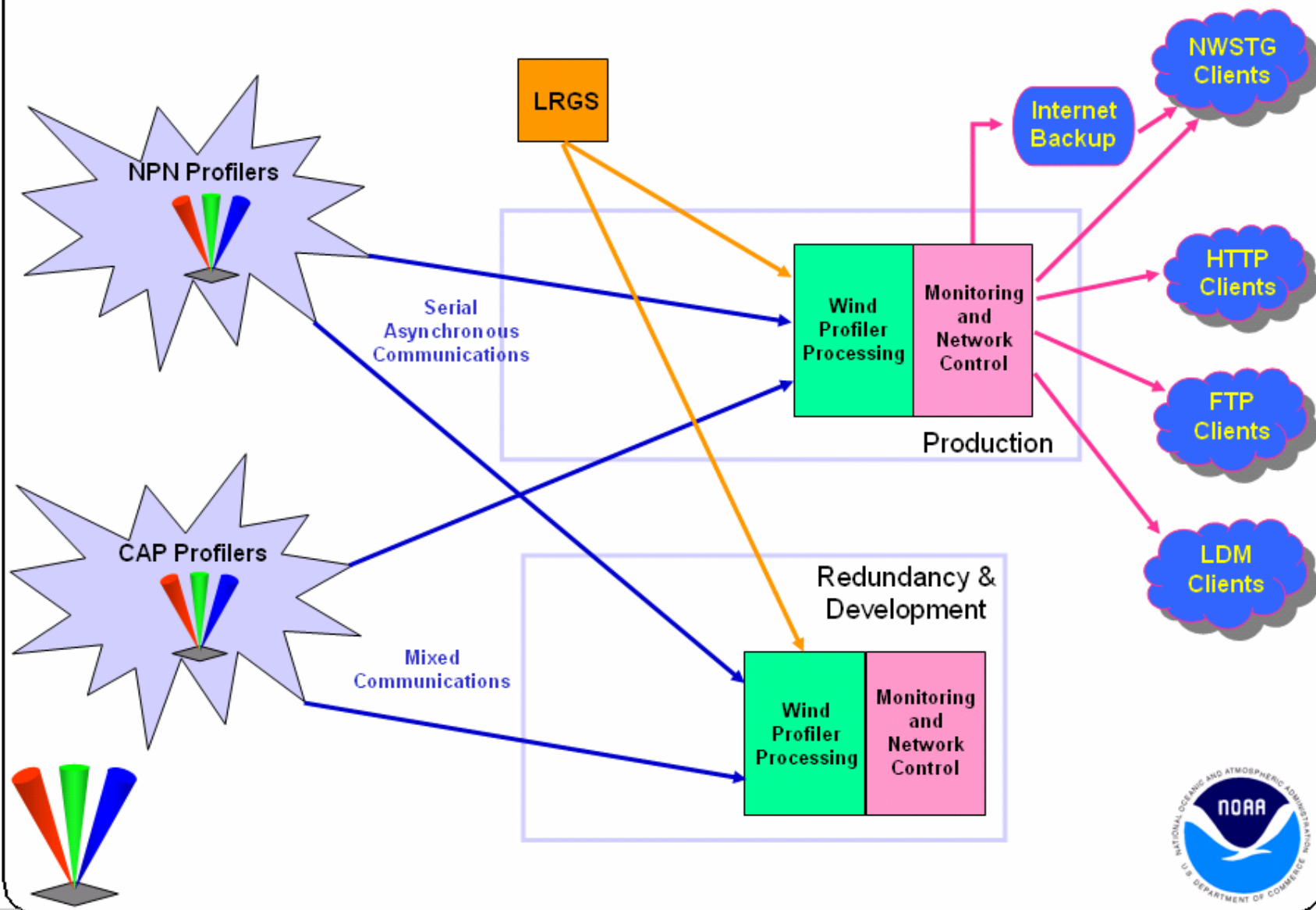


# Phase 1





# Phase 1



# Distributed Subsystems

## Wind Profiler Processing and Control

QC – Weber-Wuertz,  
bird, others

Wind calculation and  
averaging

Data displays

GOES  
transmission and  
emulation

WMO formatted messages

PMT protocol server

Serial data  
server

## Monitoring and Diagnostics

Fault tracking

Data displays

WWW displays and  
data

SARSAT generation  
(404 MHz only)

Data distribution

PMT protocol client

Serial data client

RMI, JMS

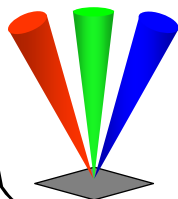
Red Hat Linux, PostgreSQL, Apache



# Distributed System Design Features

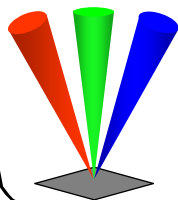
- Control via WWW interface.
- Flexible configuration.  
Ability to move a subsystem from one physical system to another without rebooting or manual editing.
- Distributed system components can run anywhere resources are available.
- Reusable JAVA objects wherever possible – BUFR encoder/decoder, displays, GOES DCP controllers.

UID	Host Name	Program Name	Instance Name	Last Mod Date	Last Mod By
35	*	*		04/19/2002 23:41:51 GMT	pihla
2	*	HeartHeartbeat		04/08/2002 20:21:13 GMT	pihla
21	*	HeartMailExitHandler		04/12/2002 21:46:35 GMT	pihla
51	*	nnp.BUFRWriter		08/05/2002 17:54:11 GMT	stierle
6	clapton.fsl.noaa.gov	*		05/17/2002 19:22:21 GMT	stierle
53	clapton.fsl.noaa.gov	cap.BUFRWriter		08/05/2002 17:54:43 GMT	stierle
43	clapton.fsl.noaa.gov	GpsBuf:GPSIn		05/17/2002 19:22:12 GMT	stierle
4	clapton.fsl.noaa.gov	HeartHeartbeat		05/17/2002 19:22:17 GMT	stierle
41	clapton.fsl.noaa.gov	nnp.BUFRWriter		05/17/2002 19:21:43 GMT	stierle
44	clapton.fsl.noaa.gov	surface.SurfaceBUFRRecorder		05/17/2002 19:21:53 GMT	stierle
49	vaughn.fsl.noaa.gov	*		05/28/2002 20:11:48 GMT	stierle



# Status of Phase 1

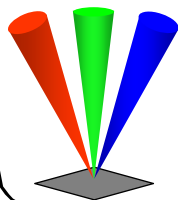
- **Distribution 95% complete**
  - Only NWS composite message still produced on HUB.
  - Single-station messages for NPN, CAP and GPS being delivered to NWSTG since February 2001.
  - NCEP is putting single-station messages “in the tanks”, expects to begin processing them operationally when their moratorium is lifted between March and July 2003.
- **Displays 70% complete**
  - Data displays complete and visible on the WWW.
  - Monitoring displays need requirements analyzed.



# Status of Phase 1

...continued

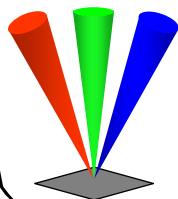
- **Acquisition 50% complete**
  - Landline data – 40% - Serial server nearly done
  - GOES data – 60% - High-data-rate DCP transmitter support for various vendors. Depends on serial server.
  - LRGS replaced obsolete DRS this month
- **Processing 50% complete**
  - Quality Control – 90% - Weber-Wuertz QC and 6 minute wind creation expected to be completed within 2 weeks.
  - System control – 10% - PMT and GOES emulation remain and depend on serial server



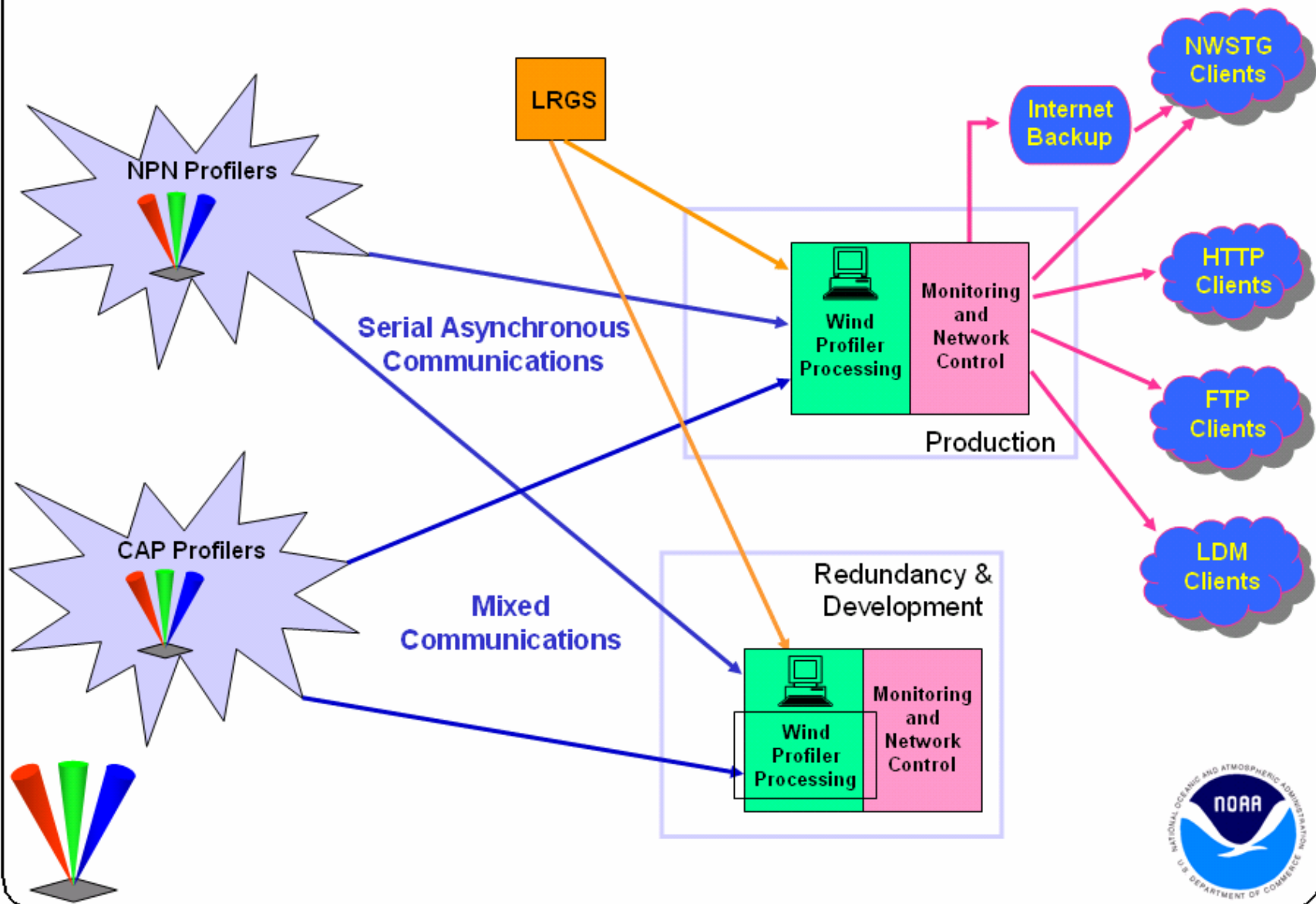


# The Near Future

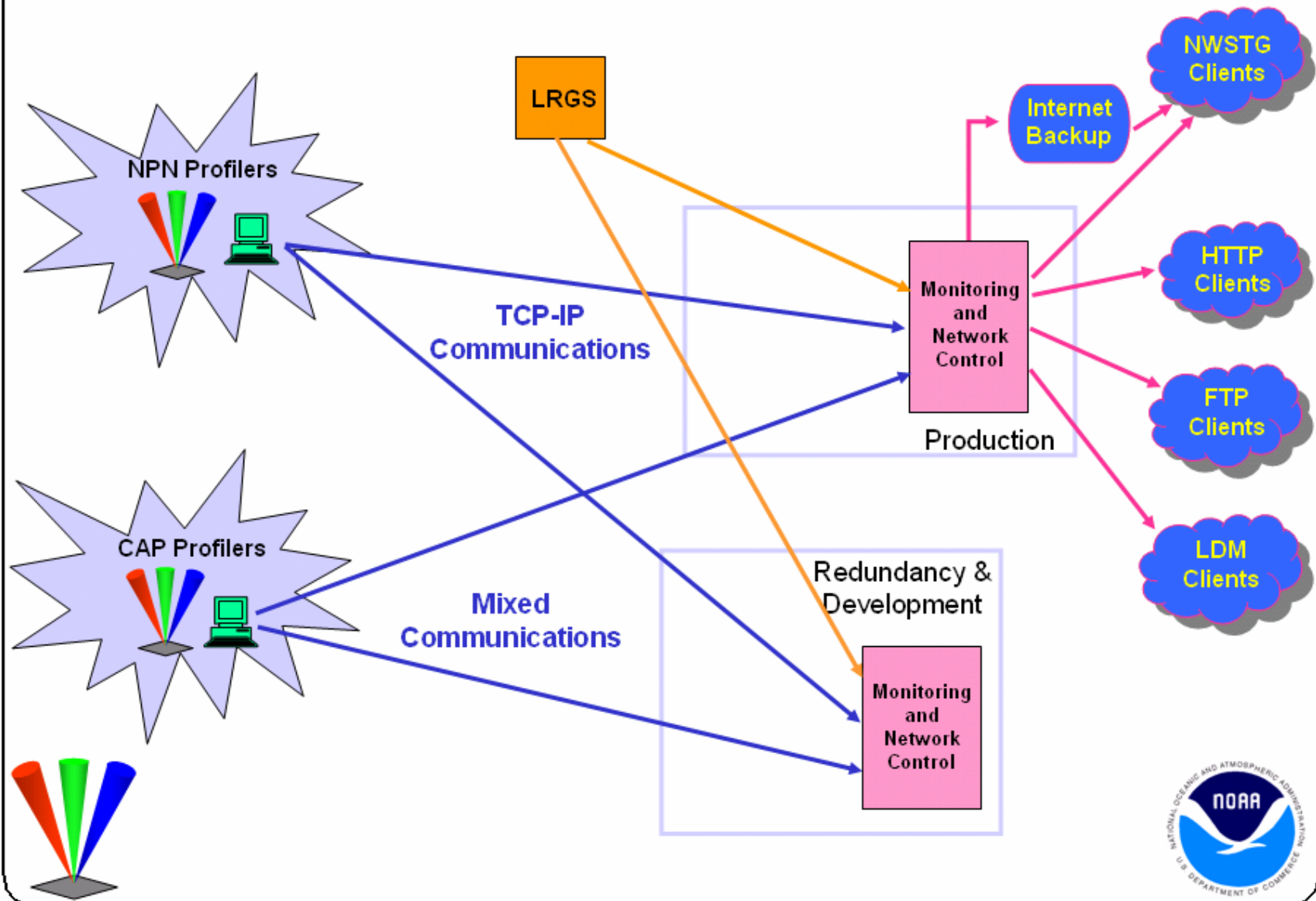
- **Phase 1 completed by October.**
- **New WWW pages online by May.**
- **Continue to collect & deliver CAP including JMA network.**
- **Acquire new CAP as opportunity arises.**



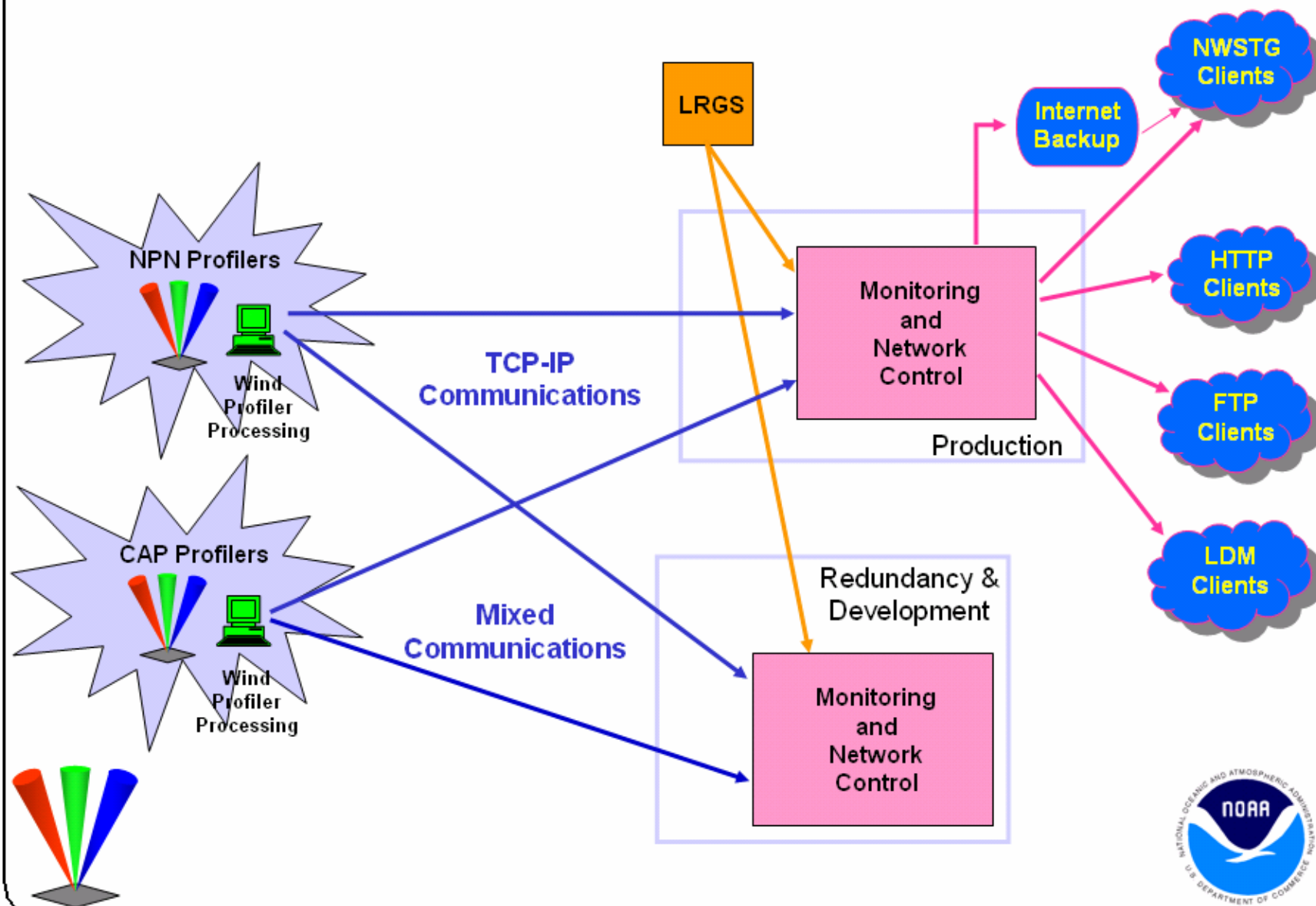
# Phase 2



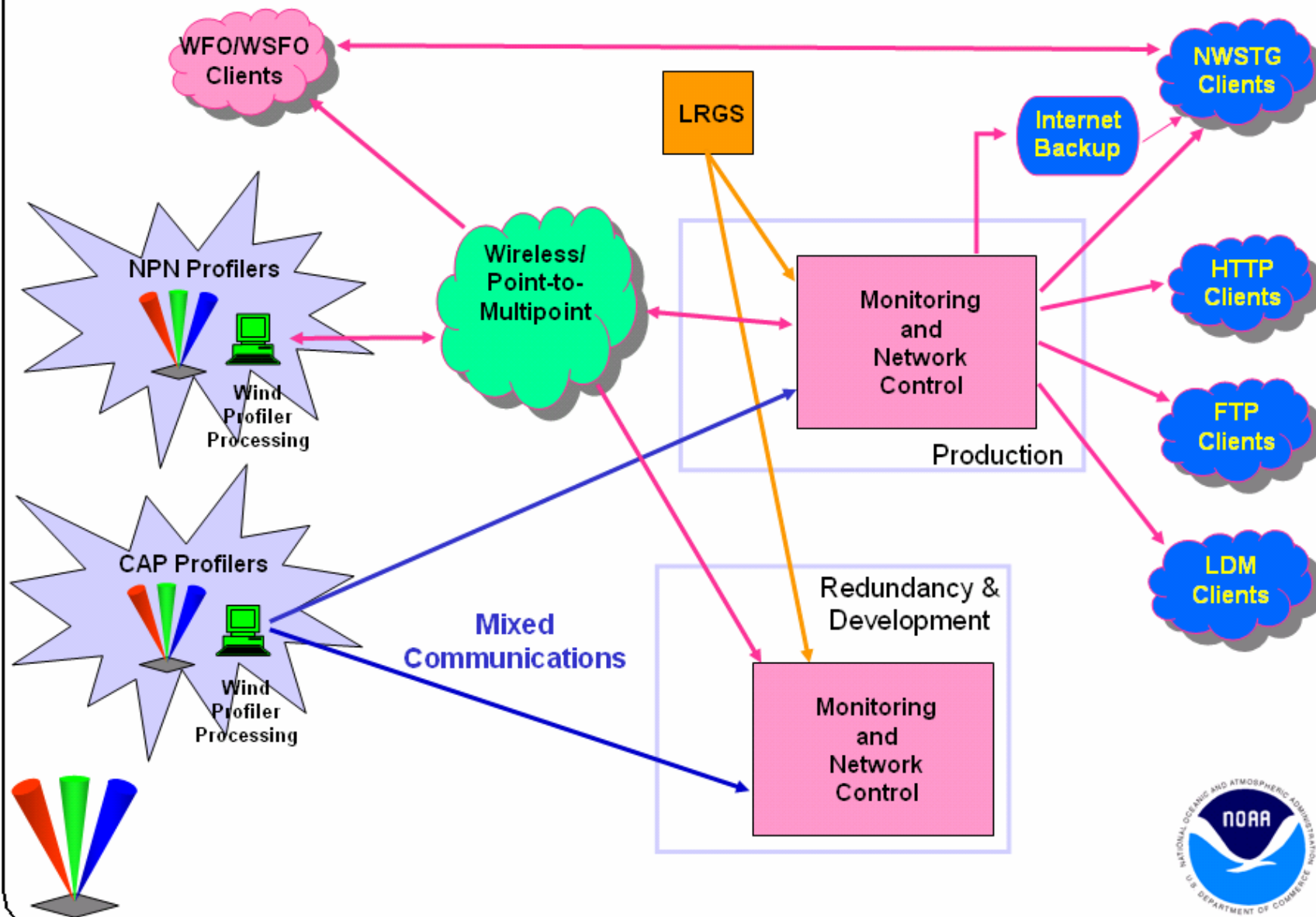
# Phase 2



# Phase 3



# Phase 3



# NOAA PROFILER NETWORK



**TECHNICAL REVIEW**

**FEBRUARY 25, 2003**

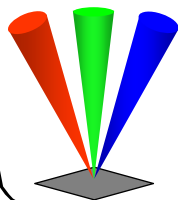


# **NOAA Profiler Network Technical Review**

## **Profiler Data on AWIPS**

**Presented by  
Patty Miller**

**System Development Division  
Scientific Application Branch**



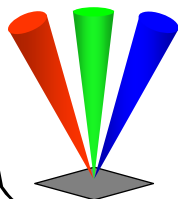
**February 25, 2003**



# Profiler Data on AWIPS

## Current Status

- **Hourly NPN Wind, Moment, and Surface Observations**
  - Data available on Satellite Broadcast Network (SBN)
  - Displays available on D2D baseline
- **CAP Winds and Surface Observations**
  - Data available through Meteorological Assimilation Data Ingest System (MADIS)
  - Displays available through D2D customization (instructions and custom files provided by MADIS)

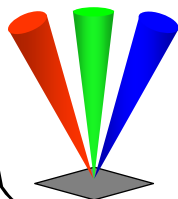


# Profiler Data on AWIPS

## Current Status

### continued

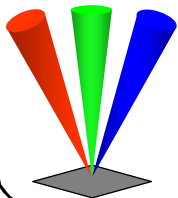
- **GPS-Met Surface Observations**
  - Data available through MADIS
  - Displays available on D2D (customization only needed for Integrated Precipitable Water Vapor (IPWV) display – instructions provided by MADIS)



# Profiler Data on AWIPS

## Near-Term Plans

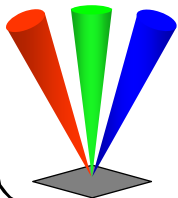
- **Update Profiler Decoder**
- **Add CAP Winds to SBN and D2D Baseline Displays**
- **Investigate RASS Displays**



# **Profiler Data on AWIPS**

## **Longer-Term Plans**

- **Add 6-Minute Wind and GPS-Met Observations to SBN and D2D Baseline Displays**



# NOAA PROFILER NETWORK



**TECHNICAL REVIEW**

**FEBRUARY 25, 2003**



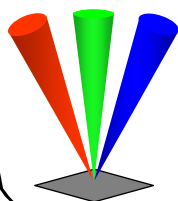
# **NOAA Profiler Network Technical Review**

## **Facilities and Systems Administration**

**Presented by  
Bobby R. Kelley**

**Facilities and Systems Administration Staff**

**James Bussard  
Michael Pando**

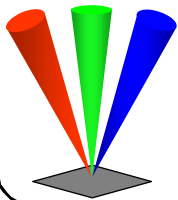


**February 25, 2003**



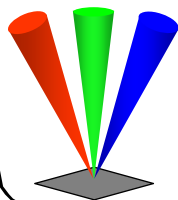
# Topics

- **Recap from 2001**
- **Hardware Then & Now**
- **Data Telecommunications Then & Now**
- **Availability Summary**
- **2001 / 2002 Actions**
- **Plans**



# Recap from 2001

- **Highly varied responsibilities**
  - **Continue ops / maintenance of HUB hardware**
    - > 13 Micro-VAX systems in two clusters running VMS 5.5
  - **Sun server & workstations running Solaris**
  - **PC servers & workstations**
    - > Running Linux / Windows (95/98/NT) / SCO Unix
- **Reuse equipment whenever practical**
  - **Census Bureau PCs & excess from FSL and others**
- **Low cost, high performance approach**
- **Maintain data telecomms costs, minimize risks**
- **Eliminate single points of failure, minimize risks**
  - **Installed UPS & connected to emergency power**



# Hardware

## Then

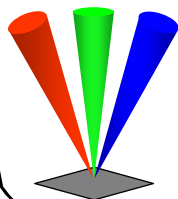
- 13 Micro-VAXs
- ~~1 Sun E3000~~
- ~~2 Sun Ultra1~~
- ~~6 SPARCstation 5~~
- 11 PCs – Linux \*
- 1 PC server – NT 4
- 34 PCs – Win 95/98/NT 4
- ~~1 PC – SCO Unix~~

\* all GPS-Met

## Now

- 13 Micro-VAXs
- 4 PC servers - Linux
- 56 PCs – Linux \*
- 1 PC server – Win 2K Adv.
- 12 PCs – Win XP
- 13 PCs – Win 2K
- 3 PCs – NT 4
- 18 PCs – Win 98
- 1 PC – Win 95

\* 39 GPS-Met  
17 NPN



# Data Telecomms

- 38 Circuits
- Includes a private link to NWSTG and two T1 circuits to Boulder

## Then

### Exception to FTS-2001

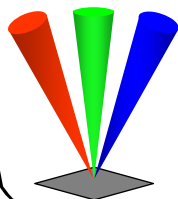
- NATO BOA
  - Unisys
  - > AT&T

## Now

### Network & Related Integration Support Services Contract

- Per MOU with DOI / MMS
  - GRCi
  - > AT&T

- Preserved \$130K investment in comms equipment
- Minimal increase in circuit costs from 2001 to now
  - 7.4% ( 17.8% less than FTS-2000E )
  - ( 67.4% less than FTS-2001 )



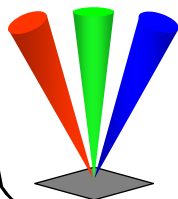
# Availability Summary

(12 Month Averages)  
(Except 449 for 1999)

<u>Calendar Year</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>
• HUB	99.1%	99.3%	99.6%	99.5%
• Landline Comms	96.2%	96.8%	96.5%	96.4%
• 404 Data to NWS	90.0%	94.4%	94.6%	94.5%
• 449 Data to NWS	71.4% Last 4 months	88.3%	94.4%	93.7%

## CY 2002

- ✓ More than 12,500 profiler days
- ✓ Only 87 landline comms faults

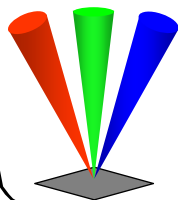






## 2001 / 2002 Actions

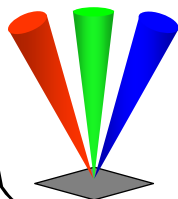
- **Maintained IT security – requires proactive vigilance these days**
- **Kept NPN processing systems availability & data delivery high**
- **Implemented test hardware for new NPN processing system**
- **Supported parallel operations with old & new NPN processing systems**



# 2001 / 2002 Actions

continued

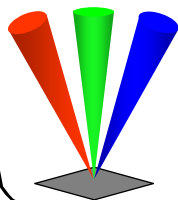
- Implemented improved file backup system
- Supported implementation of LRGS (Linux) to replace DRS (SCO Unix) for DOMSAT access
  - Backup NPN data acquisition
- Reconfigured DD network to improve management & efficiency
- Determined upcoming network requirements & coordinated within FSL to ensure long-term compatibility



# 2001 / 2002 Actions

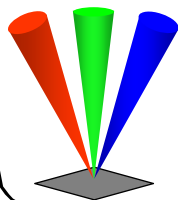
## continued

- **Installed independent computer room air conditioning unit**
  - Eliminating another single point of failure
  - DD computer facility temperature more stable
- **Implemented additional hardware for CAP data acquisition, processing & distribution**
  - At a cost of \$5,000
  - Now providing access to ~90 CAP profilers



# Plans

- **Solidify equipment & configurations for CAP processing**
  - Expand as required
- **Plan for decommissioning VAX systems**
- **Upgrade DD network & redesign computer facility**
  - Modular / extensible
- **Build out production / backup / development environments for the new NPN processing system**
  - Plan for distributed processing & data distribution





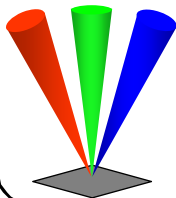




# Plans

continued

- **Research / test alternative remote site communications options**
  - **Wireless technology**
  - **Satellite-based options**
    - ✓ *(Maintain DOMSAT access as backup comms)*
  - **Communications is a significant cost for operations**
  - **Minimize future O&M costs**
- **Research implementing a long-term online data archive & retrieval system**



# NOAA PROFILER NETWORK



**TECHNICAL REVIEW**

**FEBRUARY 25, 2003**

# NOAA PROFILER NETWORK

## TECHNICAL REVIEW

### Engineering & Field Support

Presented by  
**Michael K. Shanahan**

#### ENGINEERING & FIELD OPERATIONS STAFF

Norman Abshire

Michael Carrithers

David Glaze

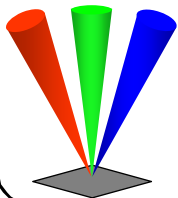
Brian Koonsvitsky

Brian Phillips

Richard Strauch

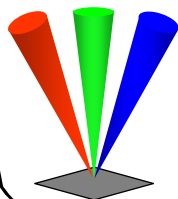
David Wheeler

February 25, 2003



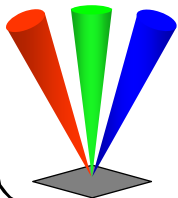
# Past Issues

- How long can we operate at 404 MHz?
  - Until they turn us off (2004)
  - Forever (as long as we don't interfere with SARSAT)
  - Dependent on number of Galileo satellites (2010)
- 404 MHz power transistors for the transmitter are not obsolete as once thought



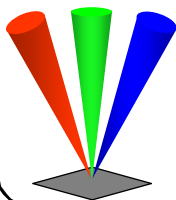
# **Recent Achievements**

- **Installed two new RASS systems at Jayton, TX and Neodesha, KS**
- **Completed comprehensive upgrade of grounding systems at all sites, including lightning and surge protection**
- **Installed 12 new DEC Alpha data processors**



# **Recent Achievements**

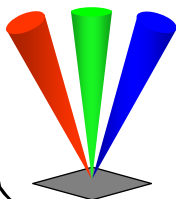
- **All deliverables to NWS-Alaska completed**
  - O&M manual, LRU Guide, Antenna and Transmitter drawings
  - Tools & Test equipment to support maintenance of profilers





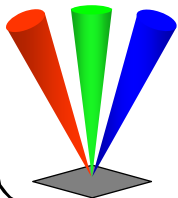
# Alaska Issues

- **Ground clutter at Central, AK profiler**
  - Research and test clutter suppression techniques.
- **Snow accumulation on the antennas.**
  - Not a serious problem to the performance of the profiler.



# Recent Achievements

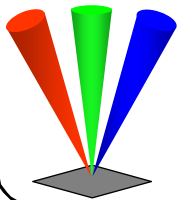
- **Moved Platteville, CO 404 MHz profiler to Ledbetter, TX**





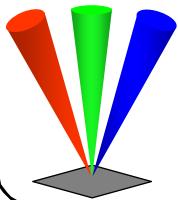
# Ledbetter, TX

- In support of the Texas Mesonet
- Fills hole in upper air measurements for NWS



# Recent Achievements

- Moved VAFB 449 MHz profiler to Platteville, CO



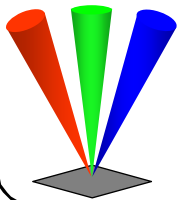






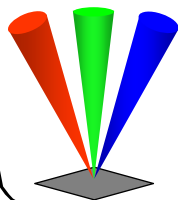
# Possible Prototype for the Future

- **Platteville is a hybrid system consisting of Vaisala signal processing and Lockheed Martin transmitter and antenna**
- **Capable of providing raw spectra**
- **Signal processing techniques are being tested by ETL**



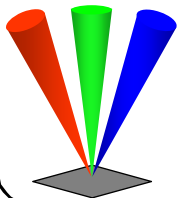
# Future Improvements

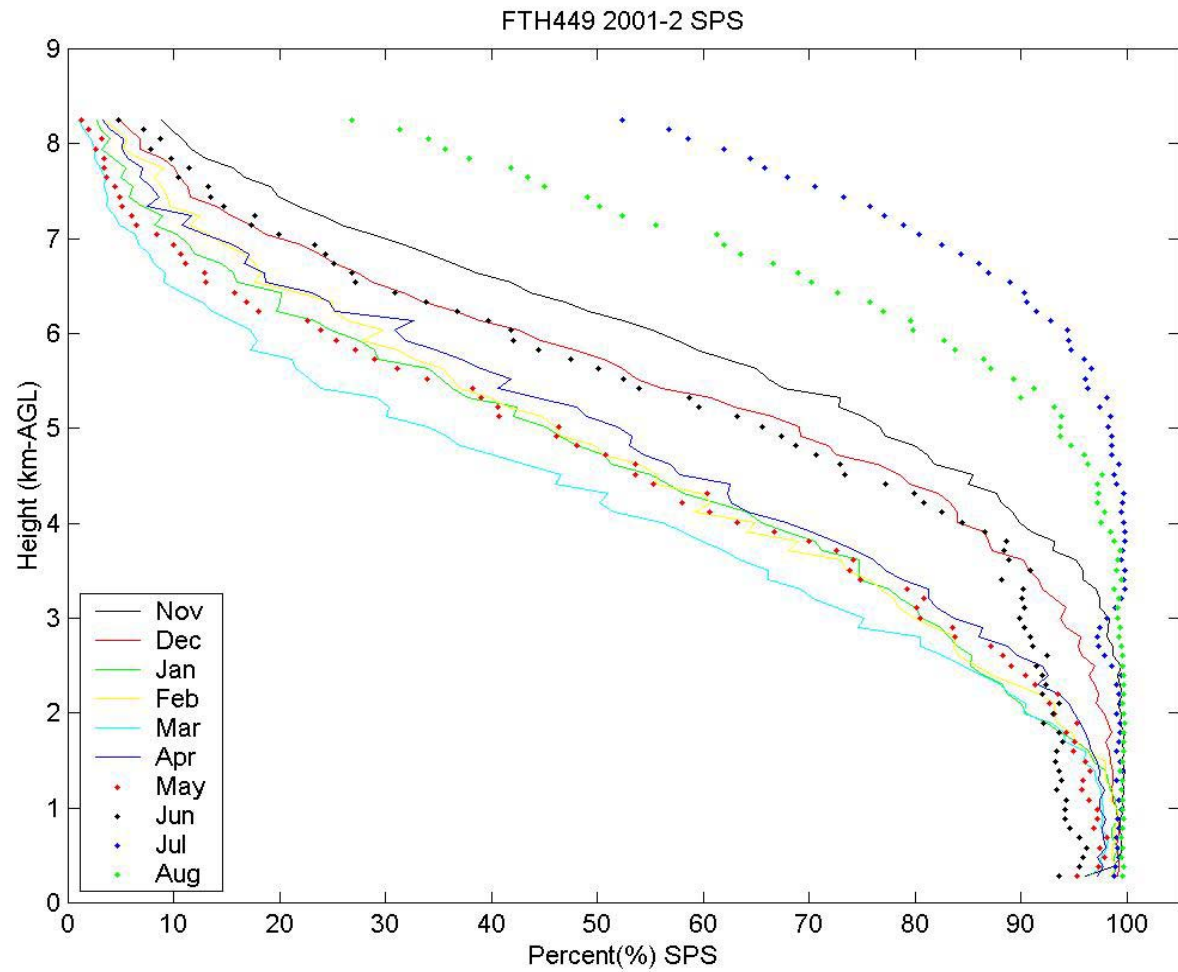
- Upgrade all sites to PSOS-II surface met package, including standard 10-m tower for surface winds
- New 449 MHz drivers and amplifiers



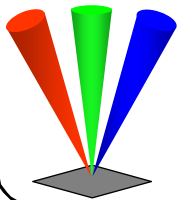
# Future Prospect

- **Support ETL Tethered Aerostat Radar System (TARS) profilers**
  - Provide maintenance and repair support
  - Create “LRU Guide to Replacement” manual





Courtesy of Dan Wolfe and ETL.



# NOAA PROFILER NETWORK



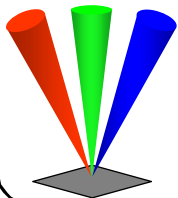
**TECHNICAL REVIEW**

**FEBRUARY 25, 2003**

# **NOAA Profiler Network Technical Review**

## **Next Generation Wind Profilers**

**Presented by  
Richard G. Strauch**



**February 25, 2003**



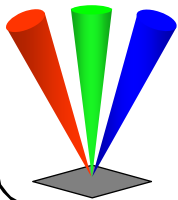


# NOAA PROFILER NETWORK

## TECHNICAL REVIEW

### NEXT GENERATION WIND PROFILERS

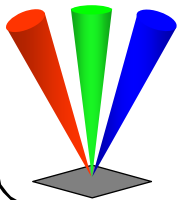
- **IMPROVED RELIABILITY**
- **FEWER OUTLIERS**



# NOAA PROFILER NETWORK TECHNICAL REVIEW

## HARDWARE

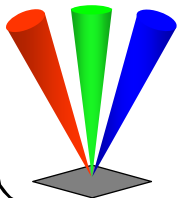
- **DIGITAL RECEIVER**
- **PHASED ARRAY ANTENNA ??**



# NOAA PROFILER NETWORK TECHNICAL REVIEW

## PROCESSING

- **LONG FFT**
- **TIME DOMAIN CLUTTER FILTER**
- **MULTIPLE SIGNAL TRACKING**
- **TURBULENCE**



# NOAA PROFILER NETWORK



**TECHNICAL REVIEW**

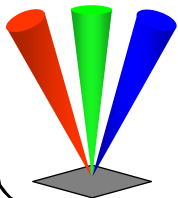
**FEBRUARY 25, 2003**

# **NOAA PROFILER NETWORK TECHNICAL REVIEW**

## **Future Focus and Summary**

**Presented by  
Margot H. Ackley**

**February 25, 2003**







# FUTURE FOCUS

**BLEAK**



**FY – 04**

**NPN Budget is de-funded  
\$0.M instead of \$4.15M**

**and**

**BRIGHT**



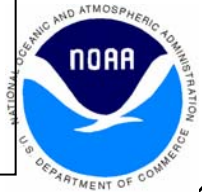
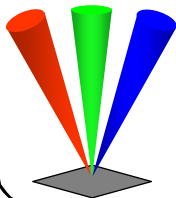
**FY – 05/06**

**NWS/FSL New Initiative**

**“NATM”**

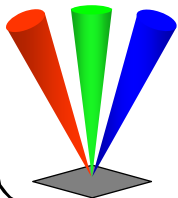
**Converts NPN to 449 MHz**

**Expands NPN Nationwide**



# Bleak

- **Very late in the FY04 budget formulation process (mid-December), Office of Management and Budget (OMB) took NPN funding out of the President's budget that was released to the nation this February.**
- **Only Congress can restore our funding.**





United States  
Department of Commerce



# National Oceanic and Atmospheric Administration

*FY 2004  
Budget Summary  
February 3, 2003*



# NOAA FY-04 Budget Summary

NOAA OFFICE OF ATMOSPHERIC AND OCEANIC RESEARCH  
(S in Thousands)

FY 04 PROPOSED OPERATING PLAN Operations, Research and Facilities	FY 2002 Enacted		FY 2003 President's Budget		FY 2004 Realign	FY 2004 President's Budget ATBs		FY 2004 President's Budget Program Changes		FY 2004 President's Budget	
	<u>FTE</u>	<u>Amount</u>	<u>FTE</u>	<u>Amount</u>	<u>FTE</u>	<u>FTE</u>	<u>Amount</u>	<u>FTE</u>	<u>Amount</u>	<u>FTE</u>	<u>Amount</u>
<b>NOAA Laboratories &amp; Joint Institutes</b>											
Aeronomy Laboratory (Colorado)	40	10,161	40	10,462	3	1	340	0	0	44	10,802
Atlantic Oceanographic and Meteorological Laboratory (Florida)	89	12,825	89	13,704	(11)	0	493	0	0	78	14,197
Air Resources Laboratory (CO,ID,NC,NV,TN)	40	5,502	40	5,815	(9)	0	238	0	0	31	6,053
Climate Diagnostic Center (Colorado)	14	2,554	14	2,662	(5)	0	83	0	0	9	2,745
Climate Monitoring and Diagnostic Laboratory (Colorado)	45	6,114	46	6,572	(9)	1	346	0	0	38	6,918
Environmental Technology Laboratory (Colorado)	44	7,548	44	7,871	(10)	0	179	0	0	34	8,050
Forecast Systems Laboratory (Colorado)	67	10,797	67	11,461	(40)	0	133	(8)	(4,150)	19	7,444
Geophysical Fluid Dynamics Laboratory (New Jersey)	74	17,297	74	17,855	36	0	943	0	0	110	18,798
Great Lakes Environmental Research Laboratory (Michigan)	51	8,229	51	8,609	6	0	260	0	0	57	8,869
National Severe Storms Laboratory (Oklahoma)	46	7,549	46	7,883	9	0	261	0	0	55	8,144
Pacific Marine Environmental Laboratory (Washington)	78	16,176	78	16,964	(1)	0	514	0	0	77	17,478
Space Environmental Center (Colorado)	47	7,476	50	8,033	2	1	258	0	0	53	8,291
<b>Subtotal, Laboratories &amp; Joint Institutions</b>	<b>635</b>	<b>112,228</b>	<b>639</b>	<b>117,891</b>	<b>-29</b>	<b>3</b>	<b>4,048</b>	<b>-8</b>	<b>-4,150</b>	<b>605</b>	<b>117,789</b>

**From: NOAA FY-04 Budget Summary**  
**February 3, 2003**  
<http://www.noaa.gov/>





## FY 2004 Budget Highlights

NOAA's Office of Oceanic and Atmospheric Research (OAR), also known as "NOAA Research," requests \$380.6 million (M) in FY'04, reflecting a net increase of \$79.1M over the FY'03 President's Budget Request. This will support the enhanced operations of the NOAA programs.

### FY 2004 Program Increases

**Climate Change Research Initiative:** NOAA requests an increase of \$16.9M and 8 FTE in the Climate Observations and Services line item and the OAR Procurement, Acquisitions, and Construction (PAC) account to work towards the goals of the Climate Change Research Initiative (CCRI). The research will be conducted in the following areas:

**Carbon Cycle Atmospheric Measurements:** \$5.0M increase to support the implementation of a Carbon Cycle Atmospheric Observing System that focuses on North America. This will improve the understanding of climate change and contribute to the scientific basis for effective management of carbon dioxide.

**Global Ocean Observing System:** \$6.3M increase to continue building a global ocean observing system that accurately documents climate-scale changes in ocean heat, carbon, and sea level. The request will permit NOAA to increase our understanding of oceanic processes through monitoring and research, to enhance our predictive capabilities, and allow us to provide sound scientific advice to those charged with managing the Nation's oceanic and atmospheric resources. It will extend and strengthen NOAA's existing ocean observation efforts across the entire ocean observing system.

**Reducing Uncertainties:** \$1M increase to support research that will yield improved decision-support tools associated with a key element of climate-change scenarios. This research will focus on a better understanding of the absorption and scattering of radiation by aerosols (fine airborne particles) and the associated heating and cooling roles in the climate system.

**Climate Change Science Program Office:** \$1.1M increase to support the initiation of an interagency Climate Change Science Program Office. The CCSP Office will coordinate research planned and implemented across the departments and agencies to support agreed-upon scientific objectives, and to provide usable, science-based products as tools for policy and management.

**CCRI Supercomputing:** \$3.5M increase in the Procurement, Acquisitions, and Construction account, to: (1) enhance NOAA's Geophysical Fluid Dynamics Laboratory's computing capability by 1/3 to enable the running of climate model simulations relevant to policy and business issues and (2) turn NOAA's investments in the Climate Change Research Initiative (CCRI) and previous research into policy relevant knowledge.

### Improved Weather Forecast Accuracy Through

**THORPEX:** An increase of \$2.5M is requested for NOAA's U.S. Weather Research Program (USWRP), including the NOAA-wide High Impact Weather initiative. \$1.3M will support The Observing System Research and Predictability Experiment (THORPEX), an emerging component of the USWRP that will significantly improve weather forecast accuracy.

**High Impact Weather:** \$1.2M will enhance the electrical load forecasting component of the agency-wide Energy Initiative. The Energy Initiative, designed to improve electrical load forecasting and energy operations management, will increase to a total of \$7.3M. The initiative is managed by the U.S. Weather Research Program (USWRP).

**Invasive Species/Ballast Water Technology:** NOAA requests an increase of \$1.0M to: (1) develop technologies for the treatment of ships' ballast water to reduce the potential for invasions of non-indigenous marine species; (2) set up a national monitoring system for aquatic nuisance species focusing on marine protected areas and areas vulnerable to invasion such as ports and harbors; and (3) test control mechanisms and restore native species and habitat conditions in invaded ecosystems.

**National Sea Grant College Program:** NOAA requests \$57.4M to support the recently enacted National Sea Grant College Program Act Amendments of 2002 (HR 3389), which reauthorized the Sea Grant program as part of the Department of Commerce.

### FY 2004 Program Decreases

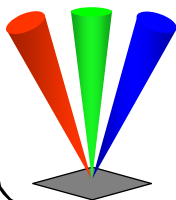
**NOAA Profiler Network:** The Administration proposes to deactivate the network, consisting of 32 profilers in the Central US and a central command and processing center in Colorado, for a savings of \$4.15 million per year. Three profilers in Alaska could continue to operate, but their data would no longer flow through the current processing center and on to the NWS and other customers. Most profilers transmit on a frequency shared by NOAA's Search and Rescue Satellite Aided Tracking (SARSAT) satellites, and briefly cease transmission as the six satellites pass. In 2006-2010 the European Union will launch many similar satellites thus causing the profilers to cease transmission nearly all the time.

For More Information:  
Mary Anne Whitcomb  
NOAA Research  
301-713-2454, ext. 173



## Bleak

- Many customers, including NWS, are aware of FY04 problem. They are lending support for restoration of funds by publicizing the value of NPN data for their particular missions.
- National media exposure, created by use of NPN data in helping to determine causes for the shuttle Columbia disaster, publicizes NPN's value.



# FUTURE FOCUS

**BLEAK**

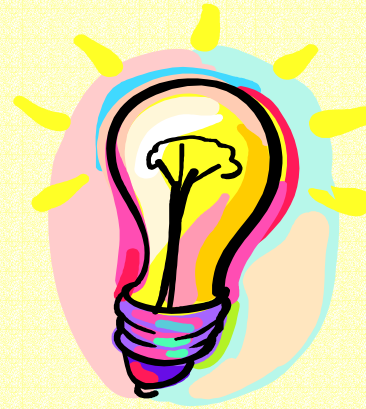


**FY – 04**

**NPN Budget is de-funded  
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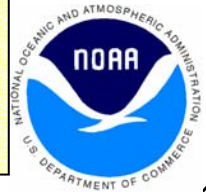
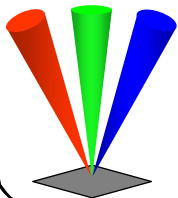
**BRIGHT**



**FY – 05/06**

**NWS/FSL New Initiative  
“NATM”**

**Converts NPN to 449 MHz  
Expands NPN Nationwide**





**DRAFT**

**January 16, 2003**

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

## **New Priorities for the 21st Century**

### **NOAA's Strategic Plan for FY 2003- FY 2008 and Beyond**



provide improved regional, national, and international assessments and projections to support policy decisions with objective information.

DRAFT

- Improved skill of climate variability forecasts.
- Increased number, accuracy, and regional specificity of North American climate, water, and coastal resource products.
- Reduced uncertainty regarding long-term climate projections, as measured through improvements in climate change models and increases in the range of their application.
- Increased involvement of NOAA researchers and use of NOAA scientific results in national and international assessments.
- Reduced uncertainty in the estimation of the U.S. terrestrial carbon sink.
- Increased number of new indicators of climate impacts on marine ecosystems.

**Engage, Advise, and Inform:** NOAA will work with users of climate information to enable and increase the application of climate information for health and safety, environmental, economic, and community planning, especially for freshwater supply, water quality, and coastal impacts.

- Increased volume of NOAA climate data and information used by NOAA customers.
- Increased number of new instances where NOAA information is integrated into decision-support and management systems.
- Increased user satisfaction, determined through surveys.

### **Mission Goal 3. SERVE SOCIETY'S NEEDS FOR WEATHER AND WATER INFORMATION**

On average, hurricanes, tornadoes, and other severe weather events cause \$11 billion in damages per year. Weather is directly linked to public safety and about one-third of the U.S. economy (about \$3 trillion) is weather sensitive. With so much at stake, NOAA's role in observing, forecasting, and warning of environmental events is expanding, and economic sectors and its public are becoming increasingly sophisticated at using NOAA's weather, air quality, and water information to improve their operational efficiencies and their management of environmental resources, and quality of life.

NOAA is strategically positioned to conduct sound science and provide integrated observations, predictions, and advice for decision makers to manage many aspects of environmental resources—from fresh water to coastal ecosystems and air quality. Bridging weather and climate time scales, NOAA will continue to collect environmental data and issue forecasts and warnings that help protect life and property and enhance the U.S. economy.

NOAA is committed to excellent customer service. We depend on our partners in the private sector, academia, and government to help disseminate critical environmental information. We will work even closer with our existing partners and will develop new partners to achieve greater public and industry satisfaction with our weather, air quality and water information. We will expand our services to support evolving national needs, including space weather, freshwater and coastal ecosystems, and air quality predictions throughout the Nation.

#### **OUTCOME MEASURES**

- Increased accuracy and amount of lead time (by category of storm type e.g. hurricanes).
- Increased satisfaction with and benefits from NOAA information and warning services, as determined by surveys and analysis of emergency managers, first responders, resource managers, industry, government and the public.

#### **STRATEGIES AND MEASURES OF SUCCESS**

**Monitor and Observe:** NOAA will use cost-effective observation systems that meet diverse and expanding societal needs for accuracy, parameters observed, and temporal and geographic coverage.

- Increased observations obtained and used from partners, both international and domestic.
- Increased observations archived, available, and accessible.
- Increased number of new multi-use observing systems deployed.
- Improved effectiveness of NOAA's observing systems.

**Understand and Describe:** NOAA will invest in new technologies, techniques, and weather and water forecast modeling.

- Increased number of modeling advances by government and academia demonstrated to improve the NOAA operational prediction suite.
- Shortened cycle times from research (government and academic) to operations (e.g., models, technology, and techniques).
- Improved accuracy of weather and air quality prediction models.
- Increased number of new research findings and progress toward their implementation in NOAA operations.

**Assess and Predict:** NOAA will improve forecast and warning capabilities to reduce uncertainty and increase economic benefits.

- Increased use of observation data for verification of and assimilated into weather, ocean, water, and climate prediction models.
- Increased number of forecasters trained in the newest techniques.
- Increased volume of forecast and warning information formatted to clarify the uncertainty of an event (e.g., space weather, air quality, water and weather forecasts).
- Improved performance of NOAA's weather and water, air quality, and space weather prediction suite.

**Engage, Advise, and Inform:** NOAA will promote appropriate responses to hazardous weather- and water-related conditions, in order to enhance human preparedness. Traditional delivery methods, the Internet, and other e-commerce approaches will be used to deliver products that customers need for safety-related decisions, operating efficiencies, and better resource management. NOAA will also provide information to support effective air quality decision-making.

- Increased number of favorable scores on public surveys of citizen knowledge about appropriate actions under hazardous weather- and water-related conditions.
- Increased percentage of the public reporting timely receipt of warnings as measured by public surveys.
- Increased number of communities with plans in place to act on weather warnings and to reduce the impacts of coastal hazards.
- Increased community knowledge of, use of, and satisfaction with NOAA information that supports local air quality monitoring and forecast programs.
- Increased assistance to international partners to improve response capabilities to weather and water predictions.

#### **Mission Goal 4. SUPPORT THE NATION'S COMMERCE WITH INFORMATION FOR SAFE AND EFFICIENT TRANSPORTATION**

**FY05 Initiative**

**Towards a  
North American  
Tropospheric Mesonet  
(NATM)**

# North American Tropospheric Mesonet (NATM)

## •Statement of Need:

- Availability of tropospheric observations does not meet requirements
- Current tropospheric observing system not optimized to support NWP and Nowcasting (<3 hour temporal resolution)

Scale	Overall Observing System Status (Green=Full, Yellow=Partial, Red=Does Not)		
	Temperature	Wind (u,v)	Humidity
Climate	RAOB/AMSU-A	RAOB LIMFAC: Limited data over oceans	RAOB/AMSU-B
Global-NWP	RAOB/AMSU-A	RAOB LIMFAC: Limited data over oceans	RAOB/AMSU-B
Mesoscale: NWP and Nowcast	Aircraft/GOES Sounder LIMFAC: Spatial and Temporal Resolution	Aircraft/ Profiler GOES Cloud Drift LIMFAC: Spatial and Temporal Resolution	NEXRAD/GOES Sounder LIMFAC: Spatial and Vertical Resolution and Accuracy
Regional: NWP and Nowcast (STIP)	Aircraft LIMFAC: Spatial and Temporal Resolution	Profiler/ NEXRAD/ Aircraft LIMFAC: Spatial Resolution and Accuracy	NEXRAD LIMFAC: Spatial and Vertical Resolution and Accuracy
Local: Nowcast (STIP)	Aircraft	NEXRAD/ Profiler LIMFAC: Spatial and Vertical Resolution and Accuracy	NEXRAD LIMFAC: Spatial and Vertical Resolution and Accuracy

# High Availability Tropospheric Observations Performance Measure Results

## WFOs with Profilers vs. WFOs without Profilers

- *Tornado lead-time improved by 3 minutes or about 38%*
- *Flash Flood lead-time improved by 8 minutes or about 19 %*



# North American Tropospheric Mesonet (NATM) Proposal

**NATM will extend skill observed in existing regional profiler network to much broader base within NWS**

## **Key Activities:**

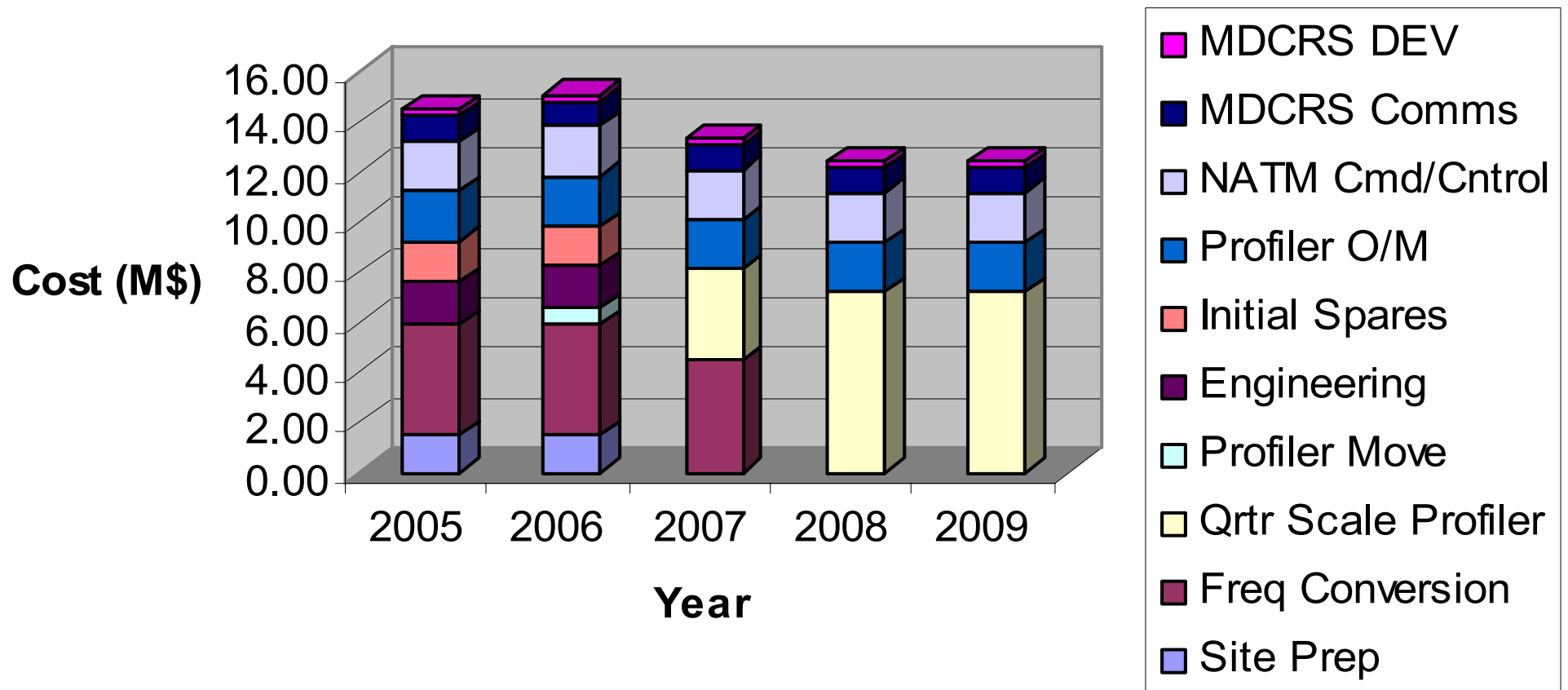
- **Establish MDCRS command and control and QC capability; improve efficiency of sounding retrievals**
- **Optimize network by redeploying 17% of the existing profilers**
- **Upgrade 30 – 16Km profilers to 449MHz**
- **Deploy 30 – 8Km profilers as “gap” fillers complimenting MDCRS data coverage**
- **Develop MDCRS adaptive observation capability**

# NATM Key Deliverables

	Fiscal Year					Total
	2005	2006	2007	2008	2009	
# Sites Prepared	18	18				36
# Profiler Frequencies Converted	10	10	10			30
# 16Km Profilers Moved (404->449MHz)		6				6
# 8Km Profilers Deployed			6	12	12	30
System Management Capabilities			MDCRS Cmd/Cntrl		MDCRS Adaptive Obs	

# NATM Annual and Unit Cost

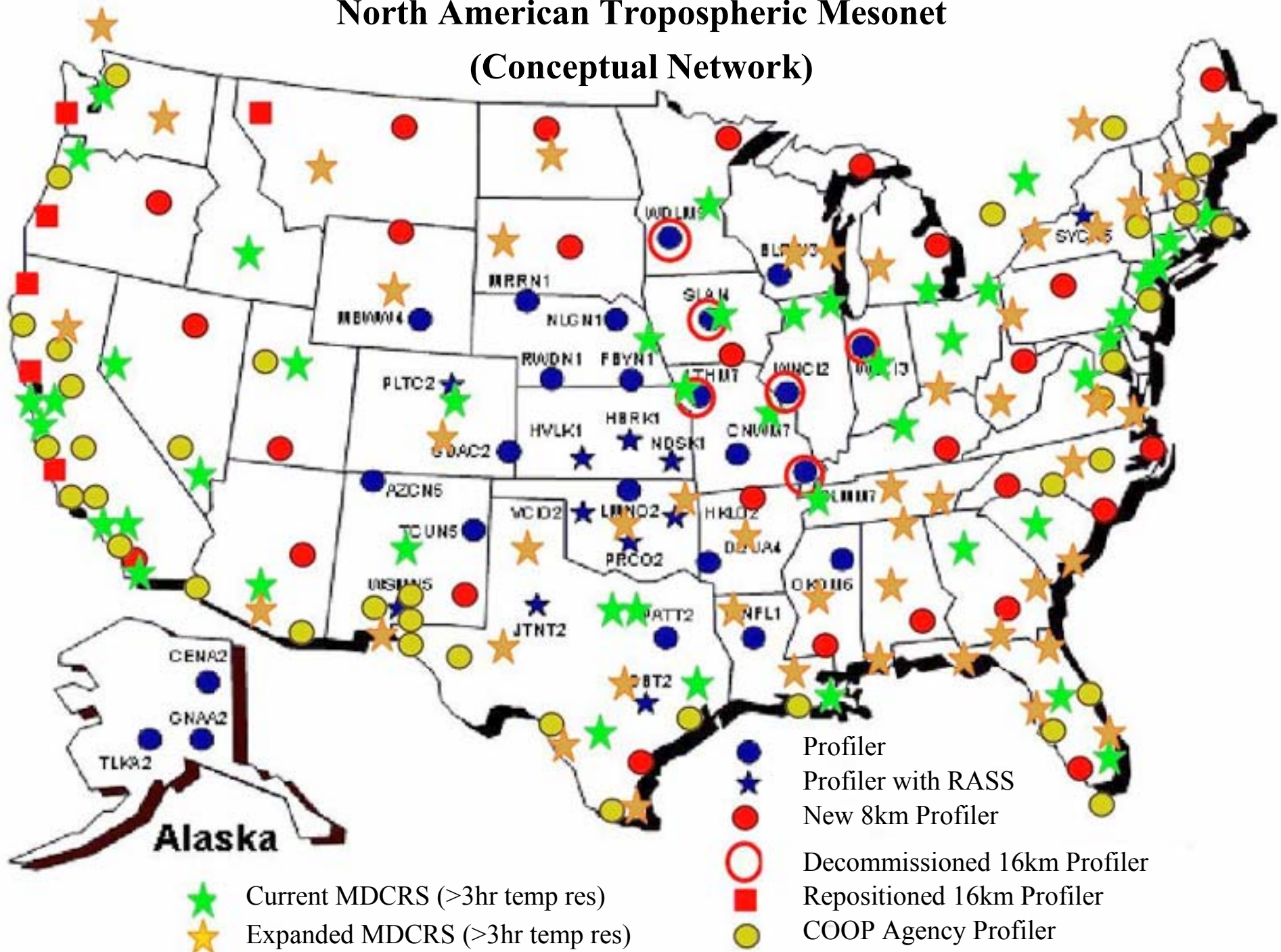
NATM Annual Cost



**“Initial Goal of the NATM is to obtain *at least* one sounding containing wind and temperature parameters for:**

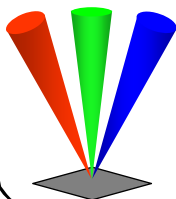
- **Every three hours**
- **At 200 km spatial resolution.”**

# North American Tropospheric Mesonet (Conceptual Network)



## Summary

- **The NOAA Profiler Network has over 10 years of proven operations, and is a trusted source of high quality, reliable data for the nation**
- **The NOAA Profiler Network:**
  - **Provides critical information.**
  - **Has a large customer base**
- **A National Profiler Network will:**
  - **Preserve the taxpayer's 15 year investment in the NPN**
  - **Provide the Nation with enhanced public safety and property protection**



**“Keep the Lights **GREEN**”**

**“We are here to **SERVE**”**





# NOAA PROFILER NETWORK



**TECHNICAL REVIEW**

**FEBRUARY 25, 2003**